Discussion Paper Series A No.671

Quantifying and Accounting for Quality Differences in Services in International Price Comparisons: A Bilateral Price Comparison between United States and Japan

Naohito Abe
(Institute of Economic Research, Hitotsubashi University)
Kyoji Fukao
(Institute of Economic Research, Hitotsubashi University)
Kenta Ikeuchi
(The Research Institute of Economy, Trade and Industry (RIETI))
and
D.S. Prasada Rao
(The University of Queensland, Brisbane, Australia)

March, 2018

Institute of Economic Research
Hitotsubashi University
Kunitachi, Tokyo, 186-8603 Japan

Quantifying and Accounting for Quality Differences in Services in International Price Comparisons: A Bilateral Price Comparison between United States and Japan

Naohito Abe and *Kyoji Fukao*
Hitotsubashi University, Tokyo, Japan

Kenta Ikeuchi
The Research Institute of Economy, Trade and Industry (RIETI), Tokyo, Japan

D.S. Prasada Rao
The University of Queensland, Brisbane, Australia

March, 2018

Acknowledgments: This work was supported by Grant-in Aid for Scientific Research (S) "Service Sector Productivity in Japan: Determinants and Policies (SSPJ)" JSPS KAKENHI Grant Number 16H06322 and (A) JSPS KAKENHI Grant Number 15H01945. Rao's work on this project was undertaken when he was a Visiting Scholar at the Institute for Economic Research at Hitotsubashi University during March-May, 2017. The authors would like to thank Erwin Diewert and participants at *Hitotsubashi Workshop on Productivity, Real Estate, and Prices* for their valuable comments.

Corresponding author: Naohito Abe; email: nabe@ier.hit-u.ac.jp

Quantifying and Accounting for Quality Differences in Services in International Price Comparisons: A Bilateral Price Comparison between United States and Japan

Naohito Abe, Kyoji Fukao, Kenta Ikeuchi and D.S. Prasada Rao

Abstract

Purchasing power parities (PPPs) from the International Comparison Program (ICP) are used for cross-country comparisons of price levels and real gross domestic product (GDP), household consumption and investment. PPPs from the ICP are also used in compiling internationally comparable output aggregates and making productivity comparisons in the KLEMS initiative. PPP compilation is anchored on the principle of comparing the like with like and price data are collected for goods and services with detailed specifications in the form of *structural product descriptions*. While this approach works well for goods, it is not effective in the case of services. If differences in service quality exist, these get reflected in the PPPs from the ICP. In this paper, we focus on the USA-Japan bilateral price comparison in the 2014 ICP in the OECD region and estimate bias induced by differences in quality of services in. Service quality is driven by various unobservable factors. In this paper we make use of data on quality differences and consumers' willingness to pay collected through a specialised survey conducted by the Japan Productivity Center early in 2017. Data are collected from a large sample of 517 respondents from USA and 519 respondents from Japan, covering 28 service items including transport, restaurants, retail services, health and education. Estimates of consumers' willingness to pay for quality differences in services by the US and Japanese consumers are obtained using standard econometric methodology, these are in turn used in estimating quality adjustment factors that can be applied to price data used in PPP computation. Using the Sato-Vartia index, which has useful analytical and decomposition properties, we find PPP for household consumption (including real estate services) of 113 JPY per US dollar reduces to 104 JPY per dollar after adjusting for quality differences. When real estate services are not included, PPP reduces from 95 JPY to 87 JPY after quality adjustment. The paper also presents labour productivity estimates before and after quality adjustment for a number of service sectors including transport and storage; retail trade; hotels and restaurants; and other subsectors. Our exploratory study demonstrates that adjustment for quality differences in services is feasible and such adjustments are important for making meaningful international price comparisons.

Keywords: International comparisons; services; quality differences; willingness to pay; Sato-Vartia Index

JEL codes: C43; E 31; and O47

1. Introduction

International price comparisons and relative levels of real income, output and productivity are critical to the assessment of economic performance of countries and convergence in the global economy. Economists, researchers and policy makers at the national and international level rely on purchasing power parities (PPPs) and real economic aggregates compiled and disseminated through the International Comparison Program (ICP) at the World Bank which is conducted under the auspices of the Statistical Commission of the United Nations. PPPs from the ICP are used in converting country-specific national accounts data, gross domestic product (GDP) and its major components, viz. private consumption, government consumption and gross fixed capital formation, expressed in national currency units into aggregates which are adjusted for currency denomination differences and also for spatial price differences.

Purchasing power parities are defined as the number of currency units that have the same purchasing power as one unit of currency of a reference country with respect to a specific basket of goods and services (details can be found in Rao, 2013). PPPs are used in ranking countries according to their real size of the global economy and that of the economies, and also for the measurement of global inequality and poverty. World Bank (2015) shows that United States is the largest followed by China and India among the top ten economies in the world. USA, China, India and Japan respectively account for 17.1, 14.9, 6.4 and 4.8 percent of the world GDP when measured in PPP terms. According to Milanovic (2002 and 2009) and World Bank (2015), global inequality measured in PPP terms shows a declining trend with a Gini measure of 0.66, 0.57 and 0.49, respectively, in 1993, 2005 and 2011.

The PPPs compiled and disseminated by the World Bank through the International Comparison Program are critical in obtaining internationally comparable output aggregates which are in turn used in measuring labor and multi-factor productivity. As the PPPs from the ICP are compiled using prices paid by consumers, a number of steps are used in converting ICP-PPPs into output side PPPs (these steps are outlined in Inklaar and Timmer, 2008 and 2013). The resulting PPPs are used in the World KLEMS Project, see worldklems.net for details of the methodology employed and data available for analytical purposes.

The main focus of the current paper is on the suitability of the PPPs currently produced by the ICP for international comparisons of real expenditures, and output and productivity and examine if these can be further improved by paying special attention to differences in quality of the goods and services priced for the purpose of PPP compilation. As the paper is on US-Japan comparison, let us focus on the PPP for Japan. Results published in World Bank (2015) show, for example, a PPP of 107.45 JPY per US dollar at the GDP level means that 107.45 Japanese Yen can buy the same basket of goods and services that can be purchased using one US dollar. This PPP is compared with the exchange rate of 79.81 JPY per US dollar prevailing in 2011. This implies that Japan price level is roughly 35 percent higher than in the United States. In principle, PPPs are like spatial price index numbers that measure differences in price levels across countries or regions which also allow for differences in currency units.

A major premise that underpins the results and applications from the ICP is that PPPs represent solely differences in prices paid for goods and services that are strictly comparable across countries. The ICP considers this issue as critical and considerable resources are devoted to ensure that prices in different countries are collected for the same product with same characteristics, to the extent possible. The basic principle of comparability is adhered to in the ICP. Vogel (2013) and Rao (2013) provide details of the survey framework used in ICP. Prices are collected for products that match the structured product descriptions (SPDs) which include all the price determining characteristics of the product. For example for the item rice, which is considered a homogeneous product, the SPDs are used to define a large number of different products. Rice includes white and brown rice; long, medium and short grain; and varieties such as basmati sometimes sold under a brand name; and in a variety of package types and sizes. Quality can enter into the definition, for example, due to varying percentages of broken rice. Similarly, prices for transport services are collected for carefully specified products such as the price of a long distance travel of 500km in an air-conditioned express train. Such a product is then priced in all the participating countries.[1]

[1] We refer to more examples of SPDs in the coming Section 2 of the paper.

Reverting to our example of a PPP of 107.454 JPY for one US dollar in 2011, the general presumption is that this PPP reflects true price level differences in these two countries. Such a presumption holds only when all the price determining characteristics including measures of quality associated with the product priced are adequately accounted for. In the event the quality of the goods and services are not adequately accounted for, the PPPs are likely to be biased and part of the PPP would reflect the unaccounted quality differences. For example, travelers who have used services in Japan and USA may find the quality of train travel in Japan is likely to be superior and it is not captured adequately by the specifications included in the SPD's for travel within the ICP.

A general conclusion emerging from the results on PPPs and real incomes from the ICP is that PPPs for low income countries tend to be generally lower than the respective exchange rates and a large number of studies have examined this observed phenomenon using the Balassa-Samuelson effect[2]. In a recent paper, Hasan (2016) demonstrated the existence of a non-monotonic relationship between income and price levels. Subsequent research by Zhang (2017) suggests that quality differences in products priced could be the source of a non-linear relationship between income and price levels. Zhang (2017, p. 55) observes, *"This explanation yields a second, distinctive, testable prediction: controlling for per capita income, a non-monotonic relationship should exist between a country's income inequality and its national price level. The second prediction is shown to be consistent with empirical evidence. The explanation also implies that mis-measured quality exaggerates the B-S relationship and hence the observed cross-country income differences are likely to be underestimated."* Anecdotal evidence coupled with recent empirical evidence suggests that quality differences are likely to have a pronounced effect on the Balassa-Samuelson relationship.

The main objective of this paper is to quantify the possible effect of unaccounted quality differences in the PPPs compiled by the ICP. This is a far-reaching objective that cannot be adequately addressed in one single study. Accordingly, we have a modest and practical aim of quantifying the quality effects by focusing on a bilateral price comparison between the United States and Japan, both of these countries are a part of the OECD PPP program. As this study focuses on just two countries, the approach we make use of differs from the studies of Hasan (2016) and Zhang (2017), both make use of cross-country and panel data sets to study the overall patterns. The research problem is to first see if quality differences exist and, if they do, what is their quantitative effect on bilateral price comparison between USA and Japan.

In this study we report results from a specialized survey conducted in Japan and the United States to examine the perceived quality differences in service sector products in these two countries. The survey focuses on 28 different services (see Section 4 for further details) including taxi, air and train travel, hotels and restaurants, etc. Responses from the survey are used in estimating consumers' willingness to pay for the superior quality (or not to pay for inferior quality) services in the countries. Our findings indicate that adjusting for quality differences reduces PPP for Japanese yen by 9 percentage points from 114 JPY for US dollar to 104 JPY. This difference has significant impact on relative levels of real consumption in these two countries. The paper also estimates the effect of adjusting for quality difference in services on service sector productivity in Japan and USA. Our results show that adjusting for quality differences increases relative labor productivity of Japan (USA = 100) from 93.8 to 114.1 for Health and Social Work sector; and from 43 to 52.6 in Transport and Storage sectors. The results vary by the sector but differences are significant in most sectors (see Section 6 for detailed results).

---

[2] In the paper by Hasan (2016), this effect is referred to as the Penn-Balassa-Samuelson effect recognizing the fact that the International Comparison Program (ICP) has its origins at the University of Pennsylvania.

The paper is structured as follows. Section 2 discusses the survey framework used in the International Comparison Program and explains how structured product descriptions are used in ensuring comparability of products and services priced across different countries. Selected examples are used to demonstrate that the problem of quality differences exists, more so in the case of services. In Section 3, we develop an analytical framework to account for quality differences and describe how the Sato-Vartia index can be used in incorporating measures of consumers' willingness to pay for higher quality services and goods. Section 4 describes the specially conducted Willingness-to-pay Consumer Preference Surveys in Japan and USA and discusses the salient features of the data collected. Section 5 discusses the econometric analysis of data collected and presents estimates of consumer's willingness to pay. Section 6 presents empirical results where quality adjusted PPPs for comparing Japanese yen with US dollar are presented. Implications of the new PPPs for the service sector productivity comparisons are discussed. The last section offers some concluding observations.

2. Purchasing Power Parities and accounting for quality differences

The main purpose of establishing the International Comparison Program at the World Bank under the auspices of the United Nations Statistical Commission is to provide reliable and timely estimates of PPPs. PPPs are measures of price level differences across countries and, thus can be used in converting country-specific economic aggregates into a common currency unit eliminating price level differences and currency denominations. For example, a PPP of 15 Indian rupees for one US dollar indicates that a basket of goods and services that can be purchased with one dollar in the United States would cost 15 rupees in India. Obviously the magnitude of PPP and its interpretation would depend on the particular basket of goods and services that is under consideration. Consequently, PPPs are compiled, at the most aggregate level, for the gross domestic product as a whole, and also for its components including Private Consumption, Government Expenditure and Gross Fixed Capital Formation.

In principle, PPPs are compiled using data on prices collected for identical products in all the participating countries. The task of preparing a list of identical products used in price surveys is quite complex and procedures used in the preparation of these lists are discussed in detail in World Bank (2013)[3] and the framework for ICP is discussed by Rao (2013) and the survey framework and product list preparation are discussed in Vogel (2013).

The simplest and most celebrated example of a PPP based on a product that is identical and comparable across all countries is the Big Mac index regularly published by the Economist magazine. The Big Mac index simply compares the price of a Big Mac paid by consumers in different countries. For example, in January 2017 one Big Mac costed 5.3 US dollars; 380 JPY and 184.05 Indian rupees. The Big Mac PPP for Japan and India with respect to US dollar are respectively, 72 JPY and 34.73 Indian rupees. These PPPs can be taken to reflect the true price level difference with respect to the basket of goods and services consisting of a single item, viz., the Big Mac. In January 2017 the market exchange rates were 113.175 JPY and 66.85 Indian rupees for dollar. These exchange rates imply that Big-Mac price level is cheaper in Japan and India compared to the United States.

The simplicity of using Big Mac for price comparisons is immediately lost once it is recognized that Big Mac is only one out of numerous goods and services belonging to the consumption basket and that it is difficult to identify products which are identical and available in different countries. An additional but a critical consideration here is that while Big Mac is identical and can priced in different countries, Big Mac is not equally representative in different countries. Dong Qiu (2016) points out that while Big Mac is probably considered an inferior good in the United States, it may be considered a luxury good in China, India and other developing countries and Big Mac is not representative of consumption in any of these countries.

The survey framework for collection of prices for the International Comparison Program needs to balance the need for comparability of products so that the resulting PPPs measure *pure* price level differences and at the same time ensure that the products priced in different countries are representative of consumption in respective countries. The ICP has developed *Structural Product Descriptions* (SPDs) for product classification and identification.

[3] This book is often referred to as the *ICP Book* by the users of ICP results.

Structural Product Descriptions

The structured product descriptions (SPDs) have been mainly used for comparisons of prices of goods and services in household consumption in the 2005 and 2011 rounds of the ICP at the World Bank and for price comparisons among the Eurostat-OECD member countries. Goods and services are first classified into homogeneous groups of goods and services, referred to as *basic headings* (BHs)[4] in the ICP parlance. Based on the Eurostat-OECD classification and the Classification of Individual Consumption by Purpose (COICO), the ICP makes use of 155 basic headings.[5]

The SPD's used in the ICP are designed along the lines of the use of *checklists* used by the Bureau of Labor Statistics (BLS) in its CPI compilation. The checklist is essentially a coding system used by the BLS to identify the specifications of the products being priced. The checklist and the SPDs identify the main price determining characteristics of the product priced, thus ensuring comparability of prices. The following are a few classification variables that make up the SPD of the product to be priced. Following Vogel (2013), we list the following characteristics:

- Quantity and packaging – specification clearly states the number of units (eg dozen eggs) or size or weight and the type of packaging. For example, rice could be purchased in countries like India either loose or in packets of size 500 gm; 1 kilogram or 5 or 10 kilogram packets.
- Source – imported or domestically produced
- Seasonal availability – whether products (eg vegetables and fruits) are available only seasonally or through out the year
- Product characteristics – these characteristics vary with the product and more characteristics are needed for more heterogeneous products like women's garments
- Brand name – whether the product priced is a brand product or a generic product. With a brand-named product, the actual brand name to be priced is also specified.

Examples of SPDs used in ICP Price Surveys

Here are a few selected examples of SPDs used for items to be priced for the 2017 ICP for the purpose of global linking purposes.[6] These are the products priced by all the participating countries and are used in linking price comparisons within each region to compile global price comparisons for countries across all regions of the world.[7]

In Table 1.1, we show the exact specifications of three rice items (for illustrative purposes) to be priced in all the participating countries.

Table 1.1 SPD's for selected Rice items

Item Code	**110111102**	**110111103**	**110111104**
Item Name	**Long-grain rice, not parboiled, WKB**	**Long grain rice, family pack, WKB**	**Jasmine rice, WKB**
Brand	Well known	Well known	Well known
Minimum quantity	0.5	4	6
Maximum quantity	1.2	10	15
Unit of measurement	Kilogram	Kilogram	Kilogram

[4] The basic headings are somewhat similar to goods and service clusters used to define elementary indexes within the context of consumer price index numbers.
[5] Eurostat and OECD have a more detailed classification consisting of 222 basic headings.
[6] We are grateful to the Global ICP Unit at the World Bank for providing us with SPD's for all the products in the global product list.
[7] See Rao (2013) for a description of the ICP work-flow and how regional comparisons are linked to form global comparisons.

Type	Long grain, white rice (milled rice)	Long grain, white rice (milled rice)	Long grain, jasmine, white rice (milled rice)
Packaging	Pre-packed; paper or plastic bag	Pre-packed; paper or plastic bag	Pre-packed; paper or plastic bag
Quality	High grade	High grade	High grade
Preparation	Non-parboiled (uncooked)	Non-parboiled (uncooked)	Non-parboiled (uncooked)
Milling			Extra-well-milled
Share of broken rice	Very low (less than 5%)	Very low (less than 5%)	Very low (less than 5%)
Aromatic (fragrant)	No	No	Yes
Enriched	No	No	No
Exclude	Premium rice (e.g. basmati rice, jasmine rice), sticky rice, quick cooking rice	Premium rice (e.g. basmati rice, jasmine rice), sticky rice, quick cooking rice	Basmati rice, sticky rice, quick cooking rice
Specify	Brand	Brand	Brand
Reference quantity	1	1	1
Reference unit of measurement	Kilogram	Kilogram	Kilogram

Source: World Bank Global ICP Unit, personal communication; Note: WKB represents well-known-brand

It is clear from these specifications that these rice items are well-specified as far as the product characteristics are concerned. However, all the experienced shoppers in different countries would have paid different prices for the same product depending on the outlet where the item is purchased, general market versus corner store versus a major super market. Differences in prices in these outlets may reflect the premium charged by the outlet for additional services provided by the outlet. In this case it is clear that prices of these products largely reflect price level differences but a small proportion of the difference could be attributed to quality differences.

Table 1.2 SPD's for Selected Men's clothing items

Item Code	**110312131**	**110312101**	**110312140**	**110312104**
Item Name	**Men's coat, WKB-M**	**Men's suit, wool, WKB-M**	**Men's suit, wool/mixed fibres, WKB-L**	**Men's trousers, cotton/polyester, WKB-L**
Item sorting code	1	2	3	4
Brand	Well Known	Well Known	Well Known	Well Known
Brand Stratum	Medium	Medium	Low	Low
Quantity	1	1	1	1
Unit of measurement	Piece	Suit	Suit	Piece
Type	Men's casual coat	Men's classic two-piece	Men's classic two-piece	Men's trousers for summer or warm weather.
Material	Cotton, synthetic or mix	100 % wool	Wool or mixed fibres (min. 50 % wool)	50-65 % cotton, rest polyester
Style	Casual, with zip fastener	Jacket: single-breasted, Trousers: straight	Jacket: single-breasted, Trousers: straight	With loops for belt
Length	Mid-thigh			Long
Sleeve length	Long	Long	Long	

Lining		Jacket: full lining; trousers: partial lining;	Jacket: full lining; trousers: partial lining;	No
Color	Single color	Dark	Dark	Single color
Pattern	Plain	Plain, stripes allowed	Plain, stripes allowed	Plain
Size	Adult medium	Adult medium	Adult medium	Adult medium
Exclude		Waistcoat	Waistcoat	
Specify	Brand	Brand	Brand	Brand, material
Reference quantity	1	1	1	1
Reference unit of measurement	Piece	Suit	Suit	Piece

Men's clothing specifications show the problematic nature of specifying all the price determining characteristics. For example, 100% wool specification while it provides some description of the product it can hardly capture the quality differences in different types of wool and also price variation across different brands. In addition to this, there are differences in the quality of tailoring associated with men's suits and trousers. The SPD's for men's clothing clearly illustrate the possible existence of quality differences in both materials and the final outfit. This is even more problematic for women's and children's garments. Thus the SPD's used in the ICP may still leave some room for quality characteristics to influence the price. This means that the resulting PPPs for clothing not only reflect price level differences but also differences in quality of the product – in this case it is the quality of wool and also quality of tailoring of the suit.

In Table 1.3 we present SPD's for selected passenger transport services by railway. The SPD's are well-specified and it is possible to price exactly same service in all the participating countries.

Table 1.3 SPD's for Passenger Transport by Railway

Item Code	**110731101**	**110731103**	**110731104**	**110731105**
Item Name	**Interurban transport, single ticket, 50 km**	**Interurban transport, single ticket, 250 km**	**Urban tram (rail) or tube, single ticket**	**Urban tram (rail) or tube, monthly ticket**
Quantity	1	1	1	1
Unit of measurement	Ticket	Ticket	Ticket	Ticket
Transportation Type	Passenger train	Passenger train	Tramway, rail or tube	Tramway, rail or tube
Ticket type	One way fare, for adult passenger; domestic trip	One way fare, for adult passenger; domestic trip	Single adult passenger one way, change allowed; domestic trip	Single adult passenger monthly ticket (pass); frequent domestic trip
Distance	50 km	250 km	Same zone, standard distance, up to 120 min	
Time	Wednesday	Wednesday		
Class	2nd ("regular" if rating does not exist)	2nd ("regular" if rating does not exist)		
Starting point	Survey city	Survey city		
Validity	1 day	1 day	1 trip (60 - 120 min.)	1 month, unlimited trips, incl. peak hours
Exclude	Special discounts; special trains with supplements	Special discounts; special trains with supplements	Special discounts; special trains with supplements	Special discounts; special trains with supplements
Reference quantity	1	1	1	1
Reference unit of measurement	Ticket	Ticket	Ticket	Ticket

However, the prices collected for services with these SPD's are unlikely to capture important quality differences in the provision of these services. For example, when it comes to train services factors like frequency, punctuality, cleanliness and safety are important quality indicators for which consumers may be willing to pay a higher price.

SPD's, PPPs and quality adjustment

In this section we attempted to describe the price survey approach that underpins price comparisons and PPPs within the ICP. We picked three examples to illustrate the type of quality differences that are not captured by the SPD's and therefore the resulting PPPs reflect price level differences as well as possible quality differences in the goods and services priced even when the countries follow the SPD's diligently in the price collection surveys. In the case of rice, there is little difference in quality once SPD's are followed. However, there could be differences in the type of services offered by different type of outlets. When it comes to men's garments, and clothing in general, there are problems with quality differences in the material used in making these garments and also quality differences in actual tailoring of these garments. When it comes to railway transport, it is possible to follow the SPD's strictly but these do not account for major differences in quality. Needless to say, quality differences would be more pronounced in the case of health and education services, personal services, and in restaurant and hotel services.

Quantifying and accounting for differences in quality of goods and services is a topic for research over the longer-term and there is a need to devise strategies which allow us to adequately account for quality differences. By focusing on a bilateral price comparison between USA and Japan, we make an attempt to obtain estimates of quality differences in 28 different types of services and also estimate the consumers' willingness to pay as a premium reflecting differences in quality of the product.

3. Analytical Framework and Index Number Approach

The framework for this study is based on standard index number theory and the earlier work of Neary (2004) and Crawford and Neary (2008) on the existence of a reference consumer in the context of international comparisons of real income. Suppose there are two countries, *j and k,* in this case the United States and Japan, and assume there is a representative consumer in each country that faces the following budget constraint,

$$\sum_{i=1}^{N} p_{il}q_{il} = I_j,\ l = j\ or\ k,$$

where p_{il} and q_{il} are price and quantity of commodity i in country l; and I is income. Suppose a commodity i in country k, such as, q_{ik} is not identical to the commodity i in country j, q_{ij}, in terms of quality. Let differential qualities in these two countries be reflected in quality adjustment factors a_{ij} and a_{ik} for a product i in countries j and k. This implies that there exists a quality adjustment factor, $1 + a_{il}, (l = j\ or\ k)$ so that $1 + a_{ij}$ unit of q_{ij} is identical to $1 + a_{ik}$ unit of the commodity i in country k, q_{ik}.

By simple manipulation, we can transform the budget constraint, as follows:

$$\sum_{i=1}^{N} \frac{(1+a_{il})}{(1+a_{il})} p_{il}q_{il} = \sum_{i=1}^{N} p_{il}^{*}q_{il}\ (1 + a_{il}) = I_l,\ l = j\ or\ k,$$

$$where \quad p_{il}^{*} = \frac{p_{il}}{(1+a_{il})}.$$

p_{il}^{*} is can be regarded as the quality adjusted price. We can also define the quality adjusted quantity, q_{il}^{*}, as,

$$q_{il}^{*} = (1 + a_{il})q_{il},\ l = j\ or\ k \text{ and for all } i.$$

The representative household in country l solves the following maximization problem,

$$\text{Max: } U(q_{1l}^{*}, q_{2l}^{*}, q_{3l}^{*}, .., q_{Nl}^{*})$$

s.t. $\sum_{i=1}^{N} p_{il}^{*} q_{il}^{*} = I_l$

From the cost minimization problem, the following expenditure function can be derived,

$$E_l(p_{1l}^{*}, p_{2l}^{*}, p_{3l}^{*}, \ldots, p_{Nl}^{*}; U_l) = \text{Min} \sum_{i=1}^{N} p_{il}^{*} q_{il}^{*}$$

$$\text{s.t. } U(q_{1l}^{*}, q_{2l}^{*}, q_{3l}^{*}, \ldots, q_{Nl}^{*}) \geq U_l$$

Then, for some utility level, *U*, using the standard Konus (1924) approach, we can define the cost of living index (COLI) between countries *j* and *k* as,

$$COLI = \frac{E(p_{1j}^{*}, p_{2j}^{*}, p_{3j}^{*}, \ldots, p_{Nj}^{*}; U)}{E(p_{1k}^{*}, p_{2k}^{*}, p_{k}^{*}, \ldots, p_{Nk}^{*}; U)}.$$

Sato-Vartia Index

In this paper we have opted to make use of the Sato (1974) and Vartia (1976) index. This index has important analytical properties including the result that the Sato-Vartia index is exact for the COLI when the utility function has the form of constant elasticity of substitution (CES) (Feenstra, 1994). Since our focus is on a binary price comparison, the use of Sato-Vartia index is quite adequate. The COLI can be expressed by the Sato-Vartia index,

$$COLI = \frac{E(p_{1j}^{*}, p_{2j}^{*}, p_{3j}^{*}, \ldots, p_{Nj}^{*}; U)}{E(p_{1k}^{*}, p_{2k}^{*}, p_{k}^{*}, \ldots, p_{Nk}^{*}; U)} = \prod_{i=1}^{N} \left(\frac{p_{ij}^{*}}{p_{ik}^{*}} \right)^{\phi_i}$$

$$= \prod_{i=1}^{N} \left(\frac{\dfrac{p_{ij}}{(1+a_{ij})}}{\dfrac{p_{ik}}{(1+a_{ik})}} \right)^{\phi_i} = \prod_{i=1}^{N} \left(\frac{p_{ij}}{p_{ik}} \frac{(1+a_{ik})}{(1+a_{ij})} \right)^{\phi_i}$$

$$\text{where } \phi_i = \left(\frac{w_{ij} - w_{ik}}{\ln(w_{ij}) - \ln(w_{ik})} \right) \Big/ \left(\sum_{i \in g} \left(\frac{w_{ij} - w_{ik}}{\ln(w_{ij}) - \ln(w_{ik})} \right) \right), \; w_{il} = \frac{p_{il} q_{il}}{\sum_{i=1}^{N} p_{il} q_{il}}.$$

We have considered other index numbers such as the Tornqvist index and the Fisher indexes which are exact when the expenditure function is represented, respectively, by a translog or quadratic functions (see Diewert, 1976). As the Tornqvist index does not satisfy the factor reversal test, we cannot use it for an exact decomposition of the value change or level differences across the two countries into the price and quantity or real expenditure component.

The Fisher index on the other hand satisfies the factor reversal test. It can be written, using the same notation as above, as

$$COLI_{kj} = \left\{ \left[\sum_{i=1}^{N} \frac{p_{ij}^{*}}{p_{ik}^{*}} \cdot w_{ik} \right] \left[\frac{1}{\left[\sum_{i=1}^{N} \frac{p_{ik}^{*}}{p_{ij}^{*}} \cdot w_{ij} \right]} \right] \right\}^{1/2}$$

This can be further expressed as:

$$COLI_{kj} = \left\{ \left[\sum_{i=1}^{N} \frac{p_{ij}(1+a_{ik})}{p_{ik}(1+a_{ij})} \cdot w_{ik} \right] \left[\frac{1}{\left[\sum_{i=1}^{N} \frac{p_{ik}(1+a_{ij})}{p_{ij}(1+a_{ik})} \cdot w_{ij} \right]} \right] \right\}^{1/2}$$

We prefer the Sato-Vartia index as it is multiplicative and also the only log-change index number that satisfies the factor reversal test. When the Sato-Vartia index is used, the value index can be decomposed into the the Sato-Vartia's price and quantity indexes;

$$\frac{Total\ Expenditure\ in\ j}{Total\ Expenditure\ in\ k} = \frac{\sum_{i=1}^{N} p_{ij} q_{ij}}{\sum_{i=1}^{N} p_{ik}\, q_{ik}}$$

$$= \prod_{i=1}^{N} \left(\frac{p_{ij}}{p_{ik}}\right)^{\phi_i} \prod_{i=1}^{N} \left(\frac{q_{ij}}{q_{ik}}\right)^{\phi_i}$$

$$= \prod_{i=1}^{N} \left(\frac{p_{ij}^*}{p_{ik}^*}\right)^{\phi_i} \prod_{i=1}^{N} \left(\frac{q_{ij}}{q_{ik}}\right)^{\phi_i} \prod_{i=1}^{N} \left(\frac{(1+a_{ik})}{(1+a_{ij})}\right)^{-\phi_i}$$

$$= \prod_{i=1}^{N} \left(\frac{p_{ij}^*}{p_{ik}^*}\right)^{\phi_i} \prod_{i=1}^{N} \left(\frac{q_{ij}^*}{q_{ik}^*}\right)^{\phi_i}.$$

The last equation indicates that if we can observe the quality adjustment factor, $1 + a_{il}, (l = j\ or\ k)$, from the value index and the standard price index, it is possible to obtain the quantity index that is equivalent to the ratio of the utility functions of the two countries. Another attractive feature of the Sato-Vartia decomposition is that we can clearly identify and quantify the effect of quality adjustment on PPPs and real expenditures. Further, the Sato-Vartia index is symmetric in that we can apply quality adjustment either to the price data or to the quantity data and we obtain the same quality-adjusted PPP.

Willingness to pay and Quality premium

Within the framework of the ICP it is very difficult to estimate quality adjustment factors for each product priced, and for a large number of countries. We make use of an alternative framework in this paper where we endeavor to estimate the willingness to pay by consumers in Japan and USA for the quality of services and products provided in the host country, i.e., by Japanese consumers for services in USA and vice versa.

The basic approach is described below. Suppose we have information on the premium for the commodity i in country j, q_{ij}, by the household in country *k* over the corresponding commodity in country *k*, q_{ik}. More specifically, suppose we can observe the price ratio that makes the two commodities, q_{ij} and q_{ik} be indifferent. Let's define b_{ik} as the premium felt by the household in country *k* for the commodity *i* in country *j*. This implies, if the price of q_{ik} is discounted by $(1 + b_{ik})$, the two commodities become identical. That is, we can obtain,

$$\frac{p_{ij}^*}{p_{ik}^*} = (1 + b_{ik})\left(\frac{p_{ij}}{p_{ik}}\right).$$

Then, let's recall the definition of the quality adjustment factor, $(1 + a_{il})$. The quality adjusted price, $p_{il}^* = p_{il}/(1 + a_{il})$, is the price for the quality adjusted commodity. Therefore,

$$\frac{p_{ij}^*}{p_{ik}^*} = \frac{p_{ij}}{p_{ik}} \frac{(1+a_{ik})}{(1+a_{ij})}.$$

This implies,

$$(1+b_{ik}) = \frac{(1+a_{ik})}{(1+a_{ij})}.$$

If the households in two countries have identical preferences, we have,

$$(1+b_{ij}) = \frac{(1+a_{ij})}{(1+a_{ik})} = \frac{1}{(1+b_{ik})}.$$

However, if the preferences are heterogeneous across countries, we need additional subscript,

$$\left[\frac{(1+a_{ij})}{(1+a_{ik})}\right]_j = (1+b_{ij}),$$
$$\left[\frac{(1+a_{ij})}{(1+a_{ik})}\right]_k = \frac{1}{(1+b_{ik})}.$$

The cost of living index based on the willingness to pay by consumers in countries *j* and *k* are respectively given by

$$COLI_k = \prod_{i=1}^{N} \left(\frac{p_{ij}^*}{p_{ik}^*}\right)^{\phi_i} = \prod_{i=1}^{N} \left(\frac{p_{ij}}{p_{ik}}\right)^{\phi_i} \frac{1}{(1+b_{ik})}^{\phi_i}$$
$$COLI_j = \prod_{i=1}^{N} \left(\frac{p_{ij}^*}{p_{ik}^*}\right)^{\phi_i} = \prod_{i=1}^{N} \left(\frac{p_{ij}}{p_{ik}}\right)^{\phi_i} (1+b_{ij})^{\phi_i}$$

Here, we use the geometric mean of the two cost of living indexes as the cost of living index of the two countries,

$$COLI = \prod_{i=1}^{N} \left(\frac{p_{ij}}{p_{ik}}\right)^{\phi_i} \left(\sqrt{\frac{(1+b_{ij})}{(1+b_{ik})}}\right)^{\phi_i}$$

The COLI index given here provides an estimate of PPP between the two countries *j* and *k* after adjusting for quality differences in the products consumed in respective countries.

4. Willingness-to-pay Using Consumer Preference Surveys in Japan and USA

The main challenge of the approach discussed in Section 3 is to estimate the willingness to pay factors, b_{ij} and b_{ik}. This is an impossible task to implement within the survey framework adopted in the ICP. Consequently, we pursue a novel alternative approach based on a direct survey of consumers in USA and Japan and seek to collect sufficient information to elicit reliable estimates of willingness-to-pay that can be used in adjusting price data collected as a part of the ICP. Details of this approach are discussed below.

Objectives

In this paper, we use data collected from a survey on consumer preferences conducted by the Japan Productivity Center.[8] The main objective of the survey is to quantify the differences in the quality of various services provided in the US and Japan. To capture the evaluation of quality the of various service items by consumers, the survey attempted to collect information on consumers' willingness to pay (WTP) for many services provided in the US

[8] The Japan Productivity Center is a non-profit organization engaging in various activities to foster productivity growth in Japan. One of the missions of the center is to construct various databases such as industrial-level productivity and firm-level customer satisfaction index.

and Japan. In many subfields of economics, WTP are routinely estimated through consumer surveys.[9] Compared to the conventional questionnaire of WTP, the survey we use in this paper is unique in the following point. Rather than asking the price level of each service item, the survey asked the "relative" price of the two similar services. More specifically, when the survey attempts to obtain the estimates of WTP of people in Japan to services available in the US, the survey asks:

> "Suppose services of the average Japanese quality were offered in the US in English. If the Japanese service was better in quality than the corresponding US service, how much more would you be willing to pay for the Japanese service?"

In empirical applications, WTP usually refers to a very specific commodity, such as a national park, that is at the center of the survey. In this paper, the main objective of the survey is to capture the general differences in quality of services in the two countries, the US and Japan. If we ask the level of WTP for a particular service, such as a restaurant, we need to be very specific about the characteristics of a restaurant, such as location, kinds of food, size, etc. Suppose one respondent answers that his/her willingness to pay for a diner in Italian restaurant is $1000. Without specific contents of the dinner, such as full-course or à la cart, with or without alcoholic beverages, etc., it is very difficult to aggregate the WTPs over individuals. On the other hand, by asking about very specific type of service, it becomes very difficult to find consumers who have utilized such a specific service. Instead, by asking the respondents about their relative willingness to pay without detailed specification, we expect to be able to capture general differences in quality of the two services provided in the US and Japan.

Scope of the Survey – services covered

The survey by the Japan Productivity Center tried to collect relative marginal willingness to pay (RMWTP) of the entire service industry for consumers. Specifically, the survey asked individuals both in the US and Japan about their RMWTP for 28 different services for consumers. The list of the 28 services as well as the brief explanations and examples is summarized in Table 2. This list consists of commonly used services which are included in the ICP price surveys.

Period of survey

The survey in Japan was conducted during the periods: February 28, 2017 ~March 21, 2017, while the survey in the US was conducted during the periods: March 14, 2017~April 11, 2017.

Eligible populations in USA and Japan

The population for the survey in Japan is all those persons aged 20 to 69, living in Japan who had visited and stayed in the US for at least three months between April, 2012 and February, 2017. We selected eligible people from those who registers as internet monitors of an internet survey by a Japanese marketing company. When selecting persons, the survey tried to match the sample distribution of age and gender to those of Japanese population survey.

The population of the survey in the US is the set of persons aged 20 to 69, living in the US who had stayed in Japan for one month or longer between April, 2012 and March, 2017. As in the survey in Japan, we selected eligible people among those who registered as monitors of internet surveys of the marketing company. Initially, the Japan Productivity Center tried to find people in the US who stayed in Japan for three months or longer since April, 2012 as in the survey in Japan. It turned out to be extremely difficult to find such people who satisfy the criteria, especially among elderly people.[10]

[9] See, for example, Carlsson and Martinsson (2001) and Vlachokostas et al. (2011).

[10] The survey drops the people who stayed in Japan as a military service because in a military base located in Japan, various services similar to those in the US are provided.

To obtain sufficient sample size, the survey changed the criteria from three months to one month in the US. As in the survey in Japan, the age and gender distribution of the sample tried to be close to those of the census in the US.[11]

Sample size

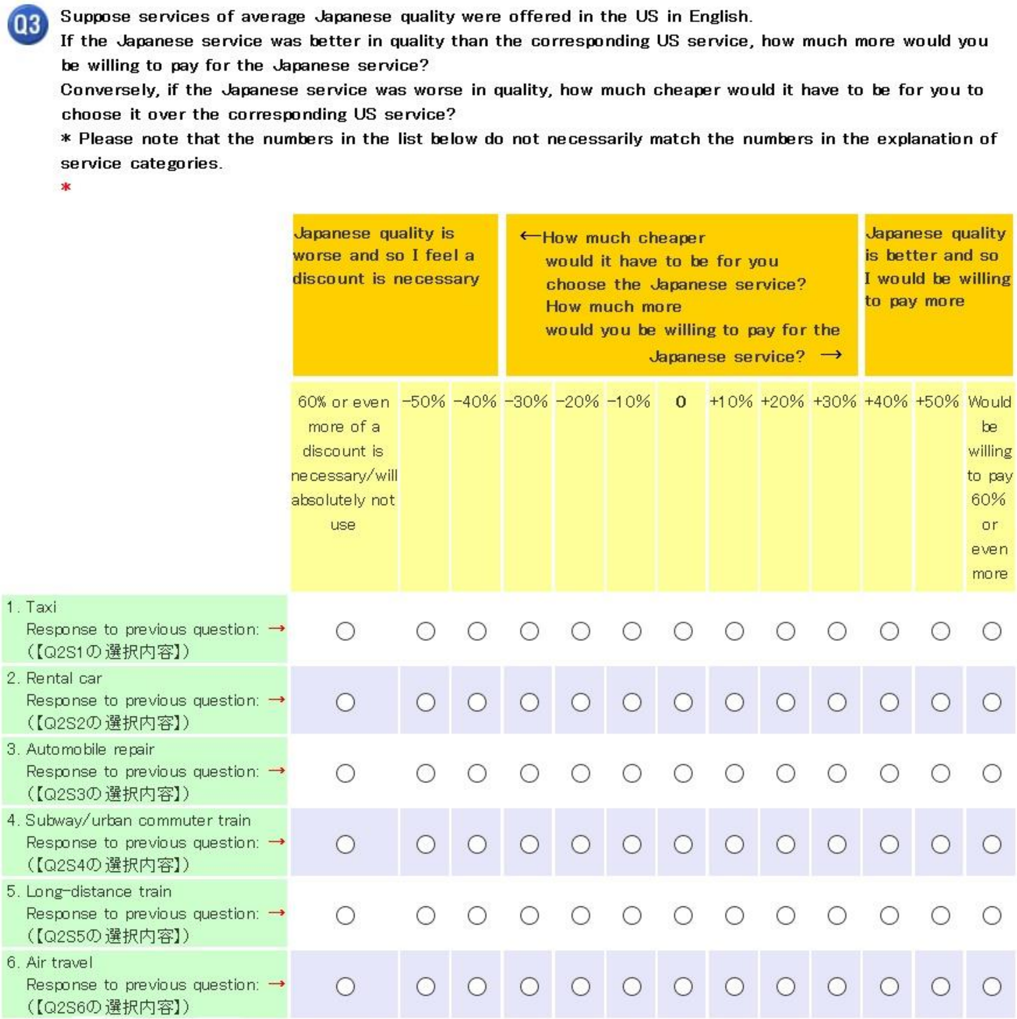
The number of respondents in the survey conducted in Japan is 519, while in the US, the sample size is 517. In each survey, the respondents were asked about the relative quality and price level of 28 different services. Survey participants are asked to select one of the 13 different brackets for their relative quality and price levels. As a part of data editing process, we dropped responses of those individuals that chose the same bracket for all the service categories for either quality or price level questions since it is quite rare that the same bracket out of 13 are chosen for all the different service items utilized. We also dropped observations with missing information. Specifically, we dropped two observations who did not answer their income (one from the sample in Japan, and one from the sample in the US), and dropped one observation from the US sample who did not answer the purpose of visiting. The effective responses for the subsequent econometric analysis are 479 for the Japan Survey and 404 for the US Survey.

[11] Due to the difficulty in finding elderly people who stayed in Japan for three months or longer during the specified periods, the ratio of elderly people in the sample in the US is smaller than the distribution in the census in the US.

Table 2: The List of Service Items in the Survey and their Explanations

1	Taxi	**does not include Uber or limousine services**
2	Rental car	**Japan examples: TOYOTA Rent-A-Lease, ORIX Auto, Nippon Rent-A-Car, Nissan Rent-A-Car, etc. US examples: Hertz, Avis, Alamo, Budget, Enterprise, etc.**
3	Automobile repair	**does not include simple inspections/maintenance at gas stations**
4	Subway/urban commuter train	**Eonly close-range transport by subway is subject here. Doesn't include longrange transport using mutual connections between a subway and other trains**
5	Long-distance train	**Japan examples: JR East, JR Tokai, and others. US examples: Amtrak, etc**
6	Air travel	**domestic flight or international flight. Does not include low-cost carriers (LLC). Japan examples: JAL, ANA, etc. US examples: American, Delta, United, Continental, etc.**
7	Parcel delivery service	**also includes USPS parcel service. Japan examples: Yamato Transport, Nippon Express, Sagawa Express. US examples: FedEx, UPS, DHL, USPS parcel service, etc.**
8	Convenience store	**Explanation: also includes drugstores. Japan examples: 7-Eleven, FamilyMart, Lawson, etc. US examples: 7-Eleven, Sheetz, United Dairy Farmers, Mobile Mart, etc**
9	General merchandise store	**refers to supermarkets centered on a self-service system and selling various daily necessities such as food, clothes, and household commodities. Japan examples: Ito Yokado, Aeon, etc. US examples: Target, Walmart, Kmart, Sears, Safeway, etc.**
10	Department store	**refers to department stores centered on a customer servicing system and also handling luxury products besides daily necessities. Japan examples: Mitsukoshi, Isetan, Takashimaya, Matsuzakaya, etc. US examples: Macy's, Saks Fifth Avenue, Bloomingdale's, JCPenny, etc.**
11	Coffee shop	**refers to shops that mainly carry products such as coffee, tea, and soft drink type beverages. Japan examples: Doutor Coffee, Starbucks, etc. US examples: McDonald's, BURGER KING, Wendy's, etc.**
12	Hamburger restaurant	**refers to restaurant that mainly serve hamburgers and similar items. Japan examples: McDonald's, MOS Burger, Lotteria, etc. US examples: McDonald's, BURGER KING, Wendy's, etc.**
13	Casual dining restaurant	**Japan examples: Skylark, Denny's, Royal Host, etc. US examples: Denny's, Waffle House, Applebee's, Chilles, Olive Garden, etc.**
14	Hotel (luxury)	**Japan examples: Imperial Hotel, Four Seasons Hotels, Hotel Okura US examples: Hyatt, CONRAD, etc**
15	Hotel (mid-range)	**Japan examples: Keio Plaza Hotel, Prince Hotel, Mitsui Garden Hotel, etc. US examples: Hilton, Marriott, etc.**
16	Hotel (economy)	**Japan examples: Toyoko Inn, Apa Hotel, Hotel Sunroute, etc. US examples: Best Western, Holiday Inn, etc.**
17	ATM, money wiring service	**instances in which you used your own cash card at an ATM in Japan. Japan examples: Mizuho Bank, Sumitomo Mitsui Banking Corporation, The Bank of Tokyo-Mitsubishi UFJ, etc. US examples: Citibank, Chase, Bank of America, First Union, etc.**
18	Real-estate agent	**refers to everything from renting and matters related to the mediation of buying/selling of real estate. Does not include mediation services such as Airbnb that are provided through the Internet exclusively.**
19	Hospital	**includes dentists, medical offices, and clinics.**
20	Postal mail	**refers to postcards, letters, FedEx (does not include parcels). Japan examples: Japan Post (post office), Yamato Transport (document delivery), etc. US examples: USPS, FedEx (does not include parcels), etc.**
21	Provider with a mobile phone line	**refers to use of mobile phone only; excludes use of communication devices without call function such as WiMAX. Japan examples: NTT DoCoMo, au, Softbank, etc. US examples: AT&T, Vodafone, T-Mobile, etc.**
22	TV reception service using cable, satellite, Wi-Fi, etc	**refers to services in Japan like Sky Perfect. Does not include paid movie distribution services such as those offered by Amazon and Apple. Also does not include outlets such as Star Channel. Japan examples: Sky Perfect, Hikari TV. US examples: Verizon, Time Warner, etc.**
23	Hair dressing/beauty services (including beauty salons)	
24	Laundry	
25	Travel services	**refers to services such as travel agencies. Does not include mediation services such as TripAdvisor that are provided through the Internet exclusively. Japan examples: JTB, Kinki Nippon Tourist, etc. US examples: Travelocity, etc,**
26	Electricity, gas, heat supply, sewerage and water distribution/pipe repairs & management	**refers to electricity, gas, heat supply, in-home sewerage and water distribution/pipe repairs & management. Does not include repairs of equipment such as air-conditioning equipment, electrical appliances, and water heaters.**
27	Museum/art gallery	
28	University education	

Figure 1: Questionnaire


Q3 Suppose services of average Japanese quality were offered in the US in English.
If the Japanese service was better in quality than the corresponding US service, how much more would you be willing to pay for the Japanese service?
Conversely, if the Japanese service was worse in quality, how much cheaper would it have to be for you to choose it over the corresponding US service?
* Please note that the numbers in the list below do not necessarily match the numbers in the explanation of service categories.
*

	Japanese quality is worse and so I feel a discount is necessary			←How much cheaper would it have to be for you choose the Japanese service? How much more would you be willing to pay for the Japanese service? →							Japanese quality is better and so I would be willing to pay more		
	60% or even more of a discount is necessary/will absolutely not use	-50%	-40%	-30%	-20%	-10%	0	+10%	+20%	+30%	+40%	+50%	Would be willing to pay 60% or even more
1. Taxi Response to previous question: → (【Q2S1の選択内容】)													
2. Rental car Response to previous question: → (【Q2S2の選択内容】)													
3. Automobile repair Response to previous question: → (【Q2S3の選択内容】)													
4. Subway/urban commuter train Response to previous question: → (【Q2S4の選択内容】)													
5. Long-distance train Response to previous question: → (【Q2S5の選択内容】)													
6. Air travel Response to previous question: → (【Q2S6の選択内容】)													

Questionnaire design

In this type of research, designing the questionnaire is an important first step. The questionnaire in this case has been carefully designed to elicit the kind of information necessary for estimating the consumers' willingness to pay. First, the survey asked each respondent whether he/she had utilized each service listed in Table 2. Then, for each service item they had experienced, they were asked about the RMWTP for the service in the foreign country to the service provided in their home country. In addition, the survey collected information about the purpose of the visits and the average exchange rate during their stays in the foreign country. The survey also asked about individual characteristics such as the family composition, household income, educational background, fluency of English for the sample in Japan or Japanese for the sample in the US. To reduce the burden of the respondents when answering their marginal willingness to pay, rather than asking for specific dollar or Yen values, the survey asked people to choose one of 13 brackets as is shown in Figure 1. In this figure, we show only six out of 28 service categories covered in this survey. If the respondents feel that service considered is of higher quality, the response will be positive and otherwise negative. Note that the responses have open-ended intervals at either end of the range and this poses econometric problems which are discussed in the next section.

Descriptive Statistics and Characteristics

The descriptive statistics of selective variables are reported in Table 3. Reflecting the ageing population in Japanese economy, the average age of the sample in Japan is much higher than that in the US sample. Probably reflecting the differences in the average ages, the ratio of married persons is much larger in Japan than in the US.

Table 3: Descriptive Statistics

	Japan					US				
	N	mean	p50	sd	Nationwide Average	N	mean	p50	sd	Nationwide Average
Age	479	44.33	43	12.83	46.4	404	35.26	33	9.93	37.6
Household Income	479	977	751	787.33	546	404	105189.9	75074.46	107174.7	53889
Female Ratio	479	0.50	0	0.50	0.514	404	0.48	0	0.50	0.508
Married	479	0.70	1	0.46	0.589	404	0.33	0	0.47	0.524
Famil Size	479	3.04	3	1.38	2.38	404	3.17	3	1.52	2.64
Universtiy Graduate	479	0.70	1	0.46	0.299	404	0.54	1	0.50	0.205
Exchange Rate	479	102.92	100	11.99		404	99.90	100	14.54	

Note: nincome: 10000 (JPY) for Japan sample, 1(US $) for US samples.

Sources: 2015 estimates of US based on the census 2010 except for education attainment (UNESCO 2015)

2015 Japan Census except for houehold income (Comprehensive Survey of Living Conditions) and education attainment (UNESCO 2010)

According to Table 3, household incomes in both the US and Japan samples are quite large compared to the nationwide average based on respective censuses. Similarly, the ratios of university graduates in the samples are much larger than those in the nationwide average based on the number given by the United Nations Educational, Scientific and Cultural Organization (UNESCO) in 2010. Such departures between our sample average and nationwide average need to be taken into account when aggregating the estimation results. Section 5 discusses this issue in detail.

Table 4 reports the sample average of several variables and the number of the observations conditioned on the utilization of each service item. The service utilization rate varies over different service items to a large extent. For example, while most people use taxi service in a foreign country, the proportions of people who used university education or real estate services are very small. Moreover, the average household income and age are heterogeneous among different service items, which might cause self-selection biases when estimating the aggregate marginal willingness to pay. This issue is considered in Section 5 intensively.

Several interesting features from Table 4 are worth noting. Utilization rates of different services show significant variation. While 87 percent of Japanese visitors to USA made use of Taxis, only 30 percent use University education followed by people using automobile repair with 38 percent. Among the US visitors to Japan only 26 percent used university education service and only 23 percent made use of automobile repair. Another feature worth mentioning is the marital status of the respondents. While 72 percent of the Japanese respondents are married, only 32 percent of the US respondents are married.

Table 4: Differences in Means of characteristics of visitors across different Service Sectors

		Japan							US						
	Sector	The number of people who utilized the service (%)	Female	Age	Family Size	Married	Income	University Graduate	The number of people who utilized the service (%)	Female	Age	Family Size	Married	Income	University Graduate
(1)	Taxi	418 (87%)	0.48	45.13	3.05	0.71	1015	0.73	302 (75 %)	0.47	35.79	3.23	0.32	110162	0.55
(2)	Rental Car	296 (62%)	0.47	44.71	3.07	0.75	1046	0.71	201 (50 %)	0.51	35.26	3.23	0.32	113002	0.54
(3)	Automobile Repair	180 (38%)	0.49	44.71	3.17	0.77	1059	0.67	92 (23 %)	0.53	33.95	3.43	0.32	137765	0.50
(4)	Subway/urban	387 (81%)	0.49	44.36	3.04	0.69	1023	0.74	202 (50 %)	0.45	35.30	3.18	0.33	101141	0.61
(5)	Long-distance Railway	244 (51%)	0.49	43.39	3.08	0.65	1016	0.77	149 (37 %)	0.45	36.03	3.13	0.33	111355	0.61
(6)	Airplane	442 (92%)	0.51	44.72	3.05	0.71	991	0.70	273 (68 %)	0.47	36.22	3.20	0.31	110879	0.59
(7)	Parcel	349 (73%)	0.54	43.38	3.10	0.72	1034	0.71	169 (42 %)	0.53	35.34	3.33	0.29	125781	0.52
(8)	Convenience Store	431 (90%)	0.51	44.45	3.05	0.70	981	0.71	242 (60 %)	0.51	36.47	3.23	0.31	110195	0.56
(9)	GMS	452 (94%)	0.52	44.75	3.01	0.71	981	0.70	248 (61 %)	0.50	36.45	3.24	0.30	109919	0.57
(10)	Department	410 (86%)	0.53	44.59	3.00	0.70	1005	0.71	241 (60 %)	0.52	36.28	3.21	0.31	108583	0.57
(11)	Coffee Shop	449 (94%)	0.52	44.63	3.03	0.72	995	0.71	257 (64 %)	0.49	36.62	3.23	0.32	103218	0.59
(12)	Hamburger Shop	450 (94%)	0.50	44.47	3.05	0.71	991	0.71	203 (50 %)	0.53	35.27	3.18	0.33	98995	0.59
(13)	Casual Restaurant	408 (85%)	0.50	44.61	3.10	0.72	1006	0.70	259 (64 %)	0.47	36.45	3.17	0.31	103875	0.58
(14)	Hotel premium	273 (57%)	0.53	46.52	3.11	0.77	1155	0.75	198 (49 %)	0.47	36.08	3.30	0.28	122439	0.61
(15)	Hotel medium	397 (83%)	0.50	45.11	3.03	0.73	1002	0.72	196 (49 %)	0.48	36.35	3.19	0.32	113100	0.57
(16)	Hotel low	348 (73%)	0.47	44.03	3.01	0.68	971	0.71	150 (37 %)	0.57	33.65	3.32	0.37	117801	0.49
(17)	ATM,	368 (77%)	0.50	44.68	3.03	0.71	1028	0.73	227 (56 %)	0.48	35.58	3.16	0.35	112723	0.58
(18)	Real-estate	172 (36%)	0.55	45.02	3.07	0.77	1079	0.73	91 (23 %)	0.57	33.30	3.21	0.36	123145	0.48
(19)	Hospital	300 (63%)	0.56	44.27	3.15	0.75	1048	0.71	105 (26 %)	0.54	33.64	3.14	0.36	126710	0.50
(20)	Postal	382 (80%)	0.54	44.69	3.06	0.72	1007	0.72	146 (36 %)	0.51	35.34	3.21	0.31	119482	0.56
(21)	Internet Provider	272 (57%)	0.49	44.88	3.15	0.75	1085	0.74	164 (41 %)	0.50	36.18	3.27	0.32	115943	0.57
(22)	TV	270 (56%)	0.52	44.34	3.20	0.75	1093	0.73	198 (49 %)	0.46	35.41	3.15	0.35	105888	0.54
(23)	Hair Salon	306 (64%)	0.53	45.53	3.06	0.75	1076	0.74	143 (35 %)	0.57	34.94	3.34	0.27	120704	0.64
(24)	Laundry	273 (57%)	0.48	45.60	3.09	0.76	1090	0.70	195 (48 %)	0.53	34.83	3.10	0.35	103134	0.54
(25)	Travel Agency	293 (61%)	0.53	45.35	3.03	0.72	1055	0.70	203 (50 %)	0.48	35.30	3.17	0.33	102532	0.59
(26)	Electricity,	241 (50%)	0.50	44.70	3.18	0.76	1066	0.71	146 (36 %)	0.48	32.69	3.11	0.37	105667	0.55
(27)	Museum/art	396 (83%)	0.54	44.92	3.02	0.72	1011	0.71	217 (54 %)	0.50	36.40	3.30	0.30	116445	0.61
(28)	University	144 (30%)	0.55	40.35	3.03	0.65	1082	0.78	107 (26 %)	0.62	32.67	3.21	0.30	123101	0.46
	Average	333.96 (70%)	0.51	44.57	3.07	0.72	1035	0.72	190.14 (47%)	0.51	35.28	3.22	0.32	113346	0.56

Note: Airplane is for only domestic flight. GMS stands for genel marchandised store.
See Table 2 for the details of each service item.
The total number of observations of the US and the Japan sample is 404 and 479, respectively.

5. Econometric Estimation of Willingness to Pay

When estimating the quality adjustment factors for each service items in both the U.S. and Japan, we encounter two major problems. The first is to convert our categorical data of respondents' willingness to pay which is in intervals into continuous variables.[12] For example, in the survey, when asked about the willingness to pay for taxi, the respondents choose one of the 13 intervals including plus and minus infinity as is illustrated in Figure 1. If the response intervals are not open-ended, we could use the simple Pareto midpoint estimator (PME) (Henson, 1967), which would give us reasonable estimates. However, if the data contains bins with plus or minus infinity, we need to assume some specific distribution functions to identify the midpoints. Usually, the underlying distribution functions are unknown. Moreover, the functions might differ across different countries for the same service items. Therefore, we need to estimate distribution functions for each service items in both countries to convert the binned data to continuous variables.

The second problem, that is potentially more serious than the first problem, is the selection biases induced by the fact that not all respondents use all the services. As shown in the previous section, the heterogeneity in average age and incomes exists among different service items. For example, the average age and household income of US sample who utilized Japanese university service are 32.67 and US $123101, respectively, while those of US sample who used hamburger shop in Japan are 35.27 and US$ 98995.42, respectively. These differences might reflect heterogeneity in preferences over service items, which might cause biases when estimating the average marginal willingness to pay. Moreover, the average household income of both the US and Japanese samples are much larger than the national average household income based on the censuses. Since we are interested in the national average level of marginal willingness to pay for each item, the adjustment of the differences in the individual characteristics among items and departures from the national average must be properly addressed.

In this paper, we deal with the both problems using suitable econometric techniques. More specifically, for the first problem, we use the Akaike Information Criteria (AIC) to find the best-fitted distribution among the class of generalized beta distributions. For the second problem, we conduct the two-step procedure of Heckman (1979), Heckit, as well as the ordinary least squares (OLS) to control for the sample selection biases. The national representative estimates are obtained by multiplying the coefficients of the main equations of the two-step procedure or the OLS with the nationwide average values, such as the average age, income, and the educational background.

Handling interval data

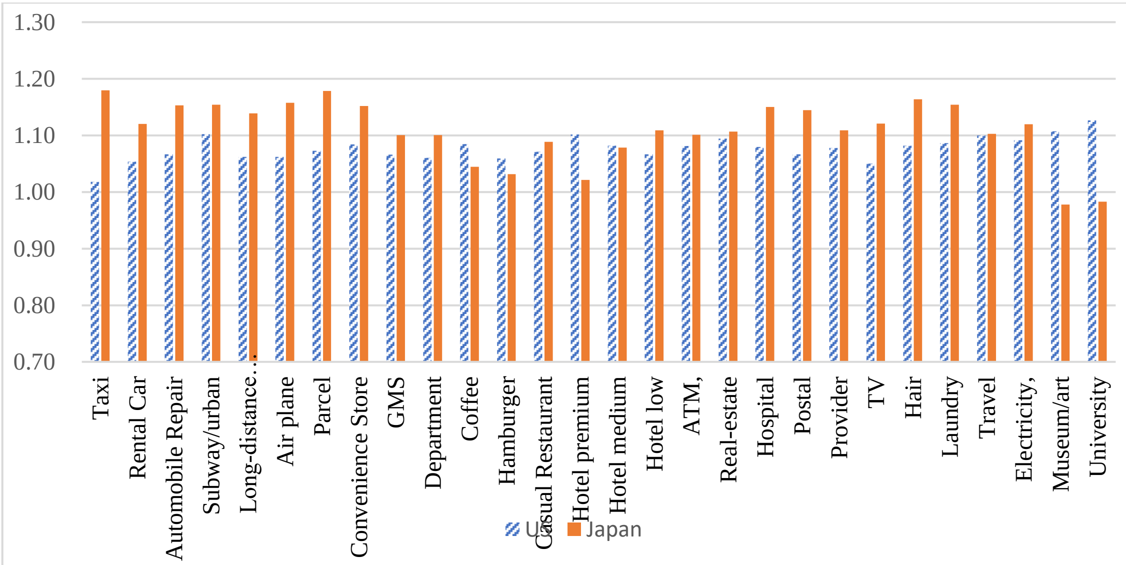
In the surveys conducted by the Japan Productivity Center conducted both in the US and Japan, respondents were asked to report their willingness to pay and household income in bins with open-ended such as "60 percent or more". Although this type of questionnaire is common in various surveys, the methods to convert the results to numerical values have not been well established. One of the conventional methods is the PME that assigns the midpoint of their bins as the numerical values, except for the top bin, where there is no midpoint. For the bins with open-ended, the PME assigns the arithmetic mean of a Pareto distribution, which sometimes gives extremely large values or even fail to converge.

In this paper, we adopt the multimodal generalized beta estimator (MGBE) proposed by von Hippel et al. (2016). The MGBE is a parametric estimator which assumes that a variable follows one of the 10 distributions in the generalized beta (GB) family.[13] The MGBE tries to fit all the 10 different distributions and selects one of them by the AIC. If some of the distributions fail to give us finite second moments, the

[12] The survey also uses categorical values when asking about household income.
[13] The distribution functions that belongs to the GB family include the generalized beta of the second kind, Dagum, Singh-Maddala, Beta of the second kind, Loglogistic, generalized gamma, gamma, Weibull, Pareto type 2, and lognormal distributions.

MGBE automatically discards the distribution, which enables us to select the best fitted distribution easily. Given the best-fitted distribution function, it is straight forward to obtain the mean values for each bin even if it contains plus or minus infinity.[14]

Figure 2: The Sample Average of RMWTP (Japan/US) of the Survey



Note: RMWTP denotes relative mean willingness to pay

Figure 2 reports the numerical estimates of the RMWTP by MGBE for each service item in the two countries. To make the comparison easy, RMWPT for both countries show the relative quality of Japanese service over the corresponding service provided in the US. As is clear from the figure, in both countries, RMWPT exceed unity, implying that in both countries, services in Japan are evaluated to be of better quality than those in the US. There are two notable exceptions, museum and university services. For these two services, people in Japan regard that quality in the US is higher than those in Japan, while the evaluation becomes the opposite in the US. We suspect that these large departures reflect selection biases, which will be discussed in the next subsection.

Accounting for Selection biases

The second problem that needs to be addressed is to account for the effects of the self-selection in the estimates of the willingness to pay. There are two sources for the selection biases.

- The first comes from the differences in the observed characteristics such as age and income between the respondents of our sample and the national representatives. For example, as Table 2 shows, the average income of our sample from the US is greater than US$100,000, which is roughly twice the average household income in the US of $54000 in 2016. Because the willingness to pay for each service item is likely depend on income, differences in the average household income between the sample and the nationwide population might cause a significant bias when estimating the average willingness to

[14] Please see von Hippel et al. (2016) for the detail of the procedure, which also provides us with a STATA ado file to implement the estimation.

pay. As long as the OLS gives us consistent estimates of the parameters for income and age, the first problem can be dealtwith quite easily. Given the estimated coefficients, we can obtain the predicted values for the national representative household by simply plugging in the nationwide average values of individual characteristics as the explanatory variables. However, if the OLS fails to give us consistent estimates due to self-selection biases, we need to address the biases properly.

- The second problem arises since the proportion of visitors using a particular service varies significantly across different services. This implies the presence of self-selection in the data. According to Figure 2, the average values of willingness to pay for Japanese university service among the US sample is 1.126, implying the respondents in the US sample appreciate the quality of Japanese university more than the service provided by the university in the US. Although it is not entirely impossible, this result contradicts with various ranking measures of university such as QS World University Rankings. We suspect that self-selection biases might be at the core of these results, that is, people in the US who utilized Japanese university services tend to appreciate Japanese service more than the average US citizens. To deal with such selection biases, we adopt the two-step procedure of Heckman (1979), Heckit.
- Specifically, in this paper, for each service item and country, we estimate the following model,

The Main Equation:

$$E\left[\left(1+b_{il}^{ks}\right)\mid D_{il}^{ks}=1\right]=x_{il}^{ks}\beta_{il}^{s}+\rho_{il}^{s}\sigma_{il}^{s}\lambda\left(Z_{il}^{ks}\gamma_{il}^{s}\right).$$

The Selection Equation:

$$Prob\left(D_{il}^{ks}=1,\, Z_{il}^{ks}\right)=f(Z_{il}^{ks}\gamma_{il}^{s}).$$

If the inverse mills ratio, $\lambda\left(Z_{il}^{ks}\gamma_{il}^{s}\right)$ fails to be rejected at 10 % level, instead of the main equation, we use

$$E\left[\left(1+b_{il}^{k}\right)\right]=x_{il}^{ks}\beta_{il}^{s},$$

where $\left(1+b_{il}^{ks}\right)$ is the relative marginal willingness to pay (RMWTP) by individual k in country s ($=$ $Japan\ or\ the\ US$) for the service of item i provided by country $l(=Japan\ or\ the\ US)$. To make the comparison easy, we define $\left(1+b_{il}^{ks}\right)$ in terms of Japanese quality. That is, if $\left(1+b_{iUS}^{ks}\right)=1.10$, this implies that person i in country s evaluates the quality of service item i provided by the US 10 % lower than the corresponding service provided in Japan. Similarly, if $\left(1+b_{iJapan}^{ks}\right)=1.20$, the quality of Japanese service is evaluated by 20 % greater than the similar service available in the US.

Selection of variables

x_{il}^{ks} is a set of variables whose nationwide average values are known. Specifically, we use female dummy, age, age squared, log family size, log household income, and university graduate dummy.

When estimating the Heckman's sample selection model, Heckit, the choice of the exclusion variables in the selection equation is crucial. Fortunately, in the survey various information that might affect the decision on the service utilization such as the fluency of foreign language, or the purpose of the visit are available. Table 5 presents the list of variables we use as the exclusion variables in Z_{il}^{ks}. Note that we also include all the variables that appear in the main equation, x_{il}^{ks}, in Z_{il}^{ks}. Finally, when estimating the above models, we use robust standard errors for the OLS and bootstrap standard errors for the Heckman's two-step procedures.

Table 5: Exclusion Variables in the Selection Equations

(1) Dummies for the Objectives of Trips		(3) Dummies for the educational Background	
	(a) sightseeing		(a) junior high school
	(b) business (working in the foreign country)		(b) high school
	(c) business (stationed in the country)		(c) technical college
	(d) business trip		(d) vocationsl school
	(e) studying abroad		(e) two-year college,
	(f) volunteer activity		(f) university (four year)
	(g) visiting family/friends, as a dependent(accompanied family)		(g) graduate school
(2) Dummies for Job Classes		(4) Dummy for Fluency of Language	
	(a) company or public officers		(a) Fluent in Japanese for US Sample
	(b) professionals		(b) Fluent in English for Japan Sample
	(c) student	(5) Nominal Exchange Rate when the respondents evalute the willingness to pay	
	(d) no job		
	(e) self-employed, agriculture, or part-time		

Note: In the selection equations, we include all the variables included in the main equations.

When obtaining the national predicted values, we conduct OLS and the Heckit for 28 service items in each country, resulting in 112 estimation results with quite a few explanatory variables. In this paper, we show the main results only, which is summarized in Table 6.[15] The predicted values based on OLS are not largely different from the sample averages, which is not surprising because the differences between the predicted values by OLS and the sample average come only from the differences in the means of the explanatory variables of the sample and national average. On the other hand, for some service items, the predicted values by Heckit depart from the sample average to a greater extent. For example, the quality of university service in Japan is evaluated higher than those in the US in the sample average, 1.13, while it becomes lower than those in the US after controlling for the sample selection, 0.81. Among 28 service items, 8 items in the US sample reject the null hypothesis that the inverse mills ratio are zero at 10 % level in the US sample. For those service items, we use the predicted values based on Heckit, while for other items in which we cannot reject the null hypothesis, we adopt the predicted values based on OLS, which are reported in the last two columns in Table 6.

Overall, it is safe to say that in both the US and Japan samples the quality of Japanese service is regarded as higher than those of service in the US. Exceptions are university, premium hotel, taxi for the US sample, and university and museum/art in Japan sample. On average, the willingness to pay for Japanese service by US sample is 7% higher than the service provided in the US, while it is 10% in Japan sample.

Estimated willingness to pay for different services by consumers from Japan and the United States presented in the last two columns provide a fairly consistent picture and the estimates appear to be plausible. The quality adjustment factor for each service would depend on the two estimates of willingness to pay. We present quality adjusted PPPs and also estimates of revised relative labor productivity in Japan with US = 100.

[15] Appendix Tables 1-4 report the full estimation results. Descriptive statistics of the selection variables are reported in Appendix Table 5.

Table 6: **Predicted Values of National Average RMWTP**

	Simple Survey Mean		Predictions from Heckman 2 step (National Average)		Inverse Mills Ratio		Predictions from OLS (National Average)		Combining OLS and Heckman (National Average)	
	US	Japan	US	Japan	US	Japan	US	Japan	US	Japan
Taxi	1.02	1.18	1.02	1.14	-0.0772	0.224**	0.99	1.19	0.99	1.14
Rental Car	1.05	1.12	1.16	1.12	-0.189+	0.0108	1.03	1.12	1.16	1.12
Automobile Repair	1.07	1.15	1.33	1.15	-0.226*	0.0260	1.06	1.17	1.33	1.17
Subway/urban	1.10	1.15	1.25	1.13	-0.172+	0.0331	1.11	1.14	1.25	1.14
Long-distance Railway	1.06	1.14	1.06	1.08	-0.0574	0.0597	1.01	1.13	1.01	1.13
Air plane	1.06	1.16	1.04	1.18	0.0143	-0.0859	1.05	1.17	1.05	1.17
Parcel	1.07	1.18	1.19	1.17	-0.0932	-0.0213	1.12	1.16	1.12	1.16
Convenience Store	1.08	1.15	1.09	1.16	-0.0207	-0.117	1.08	1.14	1.08	1.14
GMS	1.07	1.10	1.06	1.10	0.00172	-0.153	1.07	1.09	1.07	1.09
Department	1.06	1.10	1.03	1.11	0.0935	-0.00406	1.08	1.11	1.08	1.11
Coffee	1.08	1.04	1.07	1.06	0.0101	-0.128	1.07	1.05	1.07	1.05
Hamburger	1.06	1.03	1.12	1.02	-0.0645	0.110	1.07	1.03	1.07	1.03
Casual Restaurant	1.07	1.09	1.05	1.11	0.0106	-0.175*	1.06	1.07	1.06	1.11
Hotel premium	1.10	1.02	0.91	1.02	0.144+	-0.0146	1.05	1.01	0.91	1.01
Hotel medium	1.08	1.08	1.11	1.08	-0.0953	0.0230	1.05	1.08	1.05	1.08
Hotel low	1.07	1.11	1.22	1.07	-0.201+	0.0548	1.03	1.09	1.22	1.09
ATM,	1.08	1.10	1.16	1.09	-0.168*	-0.0242	1.05	1.08	1.16	1.08
Real-estate	1.09	1.11	1.01	1.12	0.0694	-0.000236	1.08	1.12	1.08	1.12
Hospital	1.08	1.15	1.20	1.10	-0.101	0.0792	1.10	1.13	1.10	1.13
Postal	1.07	1.14	1.03	1.14	-0.028	-0.00339	1.00	1.14	1.00	1.14
Provider	1.08	1.11	0.97	1.05	0.0878	-0.00369	1.05	1.05	1.05	1.05
TV	1.05	1.12	0.98	1.16	0.0524	-0.111	1.02	1.09	1.02	1.09
Hair	1.08	1.16	1.19	1.17	-0.121	-0.0176	1.07	1.16	1.07	1.16
Laundry	1.09	1.15	0.92	1.11	0.224+	0.0271	1.09	1.12	1.05	1.12
Travel	1.10	1.10	1.15	1.10	-0.113	-0.0130	1.07	1.09	1.07	1.09
Electricity,	1.09	1.12	1.12	1.10	-0.0336	0.0374	1.09	1.12	1.09	1.12
Museum/art	1.11	0.98	1.11	0.92	-0.0255	0.163*	1.09	0.97	1.09	0.92
University	1.13	0.98	0.81	0.92	0.191+	0.0487	1.02	0.98	0.81	0.98
Average	1.08	1.11	1.08	1.10			1.06	1.10	1.07	1.10

Note: + p<0.1, * p<0.05, ** p<0.01

Predicted Values of Heckman's two-step procedures are adopted when the inverse mills ratio are statististically significant at 10 % level, which is shown as the shaded cells.

Otherwise, the predicted Values of the OLS are adopted.

When constructing the national average values of prediction, we use the coefficients of either OLS or the main equation of the two-step procedure.

6. Empirical Findings

In this section, we present our main findings based on the estimates presented in the previous section. First, we provide estimates of PPPs after adjusting for quality differences in services sector. Secondly, we present revised estimates of relative labor productivity in Japan after making allowance for quality differences in services.

Quality adjusted PPPs for the Service Sector

In order to compute quality adjusted PPPs, we need three types of data: (i) the quality-unadjusted price levels at the basic heading levels; (ii) expenditure weights that are necessary for the construction of Sato-Vartia Index; and, finally, (iii) quality adjustment factors based on consumers' willingness to pay derived in Section 5. We obtained Basic Heading PPPs from the OECD for the year 2014 from the ICP unit at the OECD[16]. Since the Sato-Vartia index is multiplicative, we need to drop items with zero expenditures. By matching the categories in our Survey and the ICP data, 19 service categories[17] in our survey are included in further computations. The total expenditure on these 19 service categories are US$5.44 trillion and JPY 113 trillion.

In the OECD 2014 data, household payments for retail services (a part of the commerce margin) is included in consumption expenditure of goods. In the current study, we estimate the commerce margins using input-output tables in both countries. Recognising the role of real estate sector, we compute PPPs for the Services Sector with and without real estate. Quality adjusted PPPs are presented in Table 7 below.

Table 7: Service Sector PPPs – Main Results

	with real estate	w.o. real estate
Sato_Vartia_PPP_ICP (US/JPN)	113	95
RMWTP_Japn_SV	1.10	1.09
RMWTP_US_SV	1.07	1.06
Geometric Mean of RMWTP (JPN/US)	1.08	1.09
PPP Quality Adjusted (US/JPN)	104	88
Per Capita Quantity Index Based on ICP (JPN/US)	0.46	0.33
Per Capita Quantity Index Quality Adjusted (JPN/US)	0.50	0.36
Total Value Added of Japan (trillion yen)	113	53.1
Total Value Added of the US (trillion $)	5.44	4.27

Note: Data of PPP and Total Value Added are taken from ICP's tables of Basic Heading 2014.

SV stands for Sato-Vartia Index

The table shows interesting results. In order to focus on the effect of accounting for quality differences on PPPs, we have recomputed the Services Sector PPP using OECD data without quality adjustment but based on the Sato-Vartia Index. The PPP for Japan is 113 JPY and 95 JPY for US dollar, respectively, with and without real estate and without quality adjustment. Adjustment factors used in our analysis are presented in Table 6 and the geometric mean of average willingness to pay is roughly 1.0895 or about 9 percent.

[16] We are grateful to Francette Koechlin of the OECD for providing basic heading level PPPs and expenditures in national currency units.

[17] These are Taxi; Automobile Repair; Subway/urban; Airplane; Convenience store; GMS, Department Store; Coffee; Hamburger; Hotel, ATM; Real estate; Hospital; Postal service; Internet provider; Hair dresser; laundry; museum/art; and University.

Once we make quality adjustment for differences in services in Japan and the USA based on our survey, the PPP (with real estate) drops from 113 to 104. This has serious implications for welfare comparisons based relative per capita quantity. Without quality adjustment, Japanese real consumption of services is around 46.36 percent of the US lwevelwhich increases to 50.51 percent when adjustments for quality are made, an increase of roughly 9 percent due to quality adjustment.

If there is a difference of about 9 percent in services sector alone for two advanced countries like Japan and USA, it is difficult to imagine the effect of quality adjustment on PPPs for low income countries. Since PPPs are all expressed relative to US dollar, it means that quality adjustments need to account for service sector quality in USA and low income countries. For example, if we assume that quality adjustment increases PPP for Indian Rupee by 10 percent from 15 rupees per US dollar to 16.5 rupees for US dollar, this would have a profound effect on the estimate of absolute poverty line based on $1/day and $2/day international poverty lines. If the effect of quality adjustment is an across the board increase in PPPs of low income countries, estimates of absolute global poverty may need to be revised drastically. Similar effect will be on global and regional inequality. As quality adjustments in PPP compilation are a distant reality, we just conclude by emphasizing the need for further research in this area.

Implications for US-Japan Labor Productivity Gap

Most preceding studies comparing labor (and total factor) productivity in the United States and Japan have found that service sector productivity in Japan is much lower than that in the US (Inklaar and Timmer 2008, Ministry of Economy, Trade and Industries 2013, Jorgenson, Nomura and Samuels 2016). But these studies do not take account of differences in service qualities between Japan and the US. In this section, using our survey results, we estimate how these gaps will be narrowed when we take account of differences in service qualities between Japan and the US.

Preceding studies on Japan-US productivity level comparison heavily rely on the PPP data of the International Comparison Program (ICP) to compare sectoral gross output and input between Japan and the US. But as we have already discussed in Section 2, in the ICP survey, the quality of services is not taken into account. In the case of OECD member countries including Japan and the US, as part of the ICP, the OECD requests the government of the participating countries of the program to conduct a price survey of specified items (details of each good and service are prescribed). Based on these reports, the OECD compiles the PPP data of the ICP. For example, in the case of railway transportation in urban areas, the ticket is specified as "an area ticket that allows changing to another mode of transport (such as a bus or tram) with a validity of 60 to 120 minutes for one ride, weekdays at 5pm." As this example shows, specifications of items are mainly based on European customs. Moreover, the quality of services, such as the frequency of trains, delays, crimes, accidents, the cleanliness of trains, etc., is not taken into account (Tsukada 2017).

ICP covers products only for final expenditures. For productivity level comparison, we also need PPP for intermediate inputs, some of which are produced by business service suppliers. For this purpose, preceding works (e.g. Inklaar and Timmer 2008 and Jorgenson, Nomura and Samuels 2016) also use additional price data, such as unit prices of commodities and services (e.g. unit prices of transportation), and results of several price surveys, such as *Intermediate Goods Price Comparison Survey* of Ministry of Economy, Trade and Industry. Nomura and Miyagawa (2015) provided detailed information about these data sources for Japan-US comparison. But again, the quality of services is not taken into account well in these data. For example, in the case of door-to-door delivery service, *Intermediate Goods Price Comparison Survey* specifies the service as "charge for a door-to-door delivery of a 20kg parcel for 200km distance." In the case of office cleaning services, it specifies the service as "annual contract charge for overall cleaning of an office, floor of which is covered by carpet, in a metropolitan area building with total floor area of 3,000-5,000 square meters."[18]

As a starting point for our sectoral-level Japan-US labor productivity comparison, we use estimation results by Takizawa (2016) for 2010-12. She got annual data of sectoral-level nominal and real labor productivity (value added / total hours worked by persons engaged, in US dollars) for 1997-2010 from World KLEMS Database, April 2013 release.[19] For 2011 and 2012, she derived sectoral labor productivity from sectoral-level real value-added data of U.S. Bureau of Economic Analysis and number of hours data of U.S. Bureau of Labor Statistics. She got similar data for Japan (in Japanese yen) for 1997-2012 from JIP Database 2015.[20] She got PPP data for value added (double deflated) for 1997 from GGDC (Groningen Growth and Development Centre) Productivity Level Database.[21] Using sectoral nominal labor productivity data of Japan and the US for 1997 and these PPP data, she estimated Japan's labor productivity in comparison with the US for each sector in 1997. Then, she extrapolated this result to 2010-2012 using sectoral real labor productivity data of Japan and the US for 1997-2012.

Estimation results by Takaizawa (2016) on Japan's labor productivity (LP) in comparison with the US (US=1) in each sector for the period of 2010-2012 (three year average) are reported in column (a) of Table 8.

We revised Takizawa's estimates, using our results on service quality differences between Japan and the US. Calculation process and used data are summarized in Table 8. Column (i) shows Japan-US quality differences for each survey item estimated in Section 5. We derived service quality difference for each JIP industry i, q_i (Japan/ US) as a geometric mean of column (i). As weights for this aggregation, we used simple average of nominal household consumption expenditure in Japan and in the US for each service. These weights are reported as "weight 2" in column (h). We got expenditure data for each ICP basic heading from results of OECD, 2014 ICP Survey. In the case of retail sector, we used retail margin of each service activity in Japan as "weight 2". We got this data from Ministry of Economy, Trade and Industry, *Census of Commerce 2014*.

Our results on labor quality difference is on the quality of gross output. On the other hand, labor productivity is measured as value added per hours worked. In order to use our results for adjustment of relative labor productivity, we need to make assumptions about intermediate inputs.

Let z_i denote Japan's labor productivity in comparison with the US (US=1) in a service sector i:

$$z_i = \frac{\left(X_i^{Japan} - M_i^{Japan}\right)/L_i^{Japan}}{\left(X_i^{US} - M_i^{US}\right)/L_i^{US}}$$

where X_i^{Japan} and X_i^{US} denote gross output value of industry i in Japan and the US respectively. M_i^{Japan}, M_i^{US}, L_i^{Japan}, and L_i^{US} denote intermediate input value and hours worked at industry i of the two countries. X_i^{Japan}, X_i^{US}, M_i^{Japan}, and M_i^{US} are measured in a same currency (e.g., yen). Conversions into the same currency are based on PPP data without quality adjustment.

---

[18] Detail about this survey is available in Japanese at http://www.meti.go.jp/statistics/san/kakaku/result/result_14/xls/spec_2014.xls
[19] Data is available at http://www.worldklems.net/data.htm
[20] Data is available at https://www.rieti.go.jp/en/database/JIP2015/index.html
[21] Data is available at http://www.rug.nl/ggdc/productivity/pld/earlier-release/

On the other hand, let z_i denotes Japan's labor productivity (LP) in comparison with the US (US=1) in a service sector i after adjustment of output service quality:

$$z_i^* = \frac{\left(q_i X_i^{Japan} - M_i^{Japan}\right)/L_i^{Japan}}{(X_i^{US} - M_i^{US})/L_i^{US}},$$

where q_i denotes service quality difference in industry i (Japan/ US). To simplify our analysis, we do not take account of quality differences in intermediate inputs of services. We should note that if quality of Japan's service inputs is generally higher than corresponding service inputs in the US, we will overestimate z_i^* because of our simplification.

Let v_i denote GO (gross output)/VA (value added) ratio of JIP sector i in Japan:

$$v_i = \frac{X_i^{Japan}}{X_i^{Japan} - M_i^{Japan}}.$$

Then, we have

$$\frac{z_i^*}{z_i} = \frac{q_i X_i^{Japan} - M_i^{Japan}}{X_i^{Japan} - M_i^{Japan}} = \frac{q_i - \left(1 - \frac{1}{v_i}\right)}{\frac{1}{v_i}} = q_i + (q_i - 1)(v_i - 1).$$

The derived adjustment term, z_i^*/z_i is reported in column (c). As v_i, we used 2012 value of JIP Database 2015. This value is reported in column (f). In the case of sectors, where output is mostly used for non-consumption purposes, such as wholesale trade and research, we set z_i^*/z_i equal to one. In the case of sectors, which our survey does not cover at all, we also set z_i^*/z_i equal to one.

Next, we calculated weighted arithmetic average of z_i^*/z_i for each of Takizawa's sectors. As a weight, we used value-added share of each JIP industry within each sector in Takizawa (2016). These weights, "weight 1", are reported in column (d). We get these weights for 2012 from JIP Database 2015. Adjustment term for each of Takizawa's sectors derived in this way is reported in column (c).

Finally, by multiplying Takizawa's quality unadjusted labor productivity gap (Japan/US) (column (a)) with our aggregated adjustment term (column (c)), we get quality adjusted labor productivity gap (Japan/US). Our results are reported in column (b).

Table 8. Estimation of Quality Adjusted Labor Productivity for 2010-2012

Sector	(a) LP gap (Japan/US)	(b) Quality adjusted LP gap (Japan/US)	(c) Aggregated quality adj. term	JIP industry	(d) Weight 1	(e) Quality adj. term, z*/z	(f) GO/VA ratio	(g) Aggregated quality diff.	Survey item	(h) Weight 2	(i) Quality diff.
Wholesale and retail trade	0.375	0.406	1.082	Wholesale	56%	1.000	1.463	1.000	-	-	-
				Retail	40%	1.162	1.460	1.111	Convenience store	30%	1.141
									General merchandise store	36%	1.090
									Department store	34%	1.107
				Automobile maintenance services	5%	1.398	2.306	1.173	Automobile repair	-	1.173
Hotels and restaurants	0.333	0.385	1.156	Eating and drinking places	71%	1.178	2.439	1.073	Coffee shop	41%	1.055
									Hamburger restaurant	18%	1.030
									Casual dining restaurant	41%	1.111
				Accommodation	29%	1.102	1.701	1.060	Hotel (luxury)	33%	1.008
									Hotel (mid-range)	33%	1.084
									Hotel (economy)	33%	1.090
Transport and storage	0.430	0.526	1.225	Railway	18%	1.245	1.783	1.138	Subway	50%	1.141
									Long-distance train	50%	1.134
				Road transportation	49%	1.239	1.506	1.159	Taxi	53%	1.193
									Rental car	47%	1.122
				Water transportation	9%	1.000	3.072	1.000	-	-	-
				Air transportation	7%	1.341	1.973	1.173	Air travel	-	1.173
				Other transportation and packing	17%	1.230	1.804	1.127	Parcel delivery service	50%	1.161
									Travel services	50%	1.095
Post and telecommunications	0.713	0.753	1.056	Telegraph and telephone	42%	1.074	1.623	1.046	Provider with a mobile phone line	-	1.046
				Mail	6%	1.202	1.455	1.139	Postal mail	-	1.139
				Broadcasting	8%	1.181	2.051	1.088	TV reception service using cable, satellite, Wi-Fi, etc.	-	1.088
				Information services and internet-based services	42%	1.000	1.720	1.000	-	-	-
				Video picture, sound information, character information production and distribution	3%	1.000	2.864	1.000	-	-	-
Financial intermediation	0.495	0.539	1.089	Finance	72%	1.123	1.553	1.079	ATM, money wiring service	-	1.079
				Insurance	28%	1.000	1.710	1.000	-	-	-
Real estate activities	0.056	0.057	1.019	Real estate	13%	1.154	1.321	1.117	Real-estate agent	-	1.117
				Housing	87%	1.000	1.119	1.000	-	-	-

Sector	(a) LP gap (Japan/US)	(b) Quality adjusted LP gap (Japan/US)	(c) Aggregated quality adj. term	JIP industry	(d) Weight 1	(e) Quality adj. term, z*/z	(f) GO/VA ratio	(g) Aggregated quality diff.	Survey item	(h) Weight 2	(i) Quality diff.
Renting of m&eq and other business activities	0.415	0.428	1.032	Research (private)	2%	1.000	1.524	1.000	-	-	-
				Advertising	4%	1.000	5.353	1.000	-	-	-
				Rental of office equipment and goods	13%	1.000	1.458	1.000	-	-	-
				Automobile maintenance services	5%	1.398	2.306	1.173	Automobile repair	-	1.173
				Other services for businesses	71%	1.000	1.336	1.000	-	-	-
				Research (public)	2%	1.000	2.360	1.000	-	-	-
				Research (non-profit)	0%	1.000	1.154	1.000	-	-	-
Education	1.217	1.180	0.970	Education (private and non-profit)	25%	0.966	1.348	0.975	Museum/art gallery	2%	0.969
									University education	98%	0.975
				Education (public)	75%	0.971	1.155	0.975	Museum/art gallery	2%	0.969
									University education	98%	0.975
Health and social work	0.938	1.141	1.217	Medical (private)	62%	1.226	1.714	1.132	Hospital	-	1.132
				Hygiene (private and non-profit)	1%	1.000	1.260	1.000	-	-	-
				Medical (public)	15%	1.220	1.669	1.132	Hospital	-	1.132
				Hygiene (public)	2%	1.000	1.318	1.000	-	-	-
				Medical (non-profit)	20%	1.218	1.658	1.132	Hospital	-	1.132
Other community, social and personal services	0.672	0.740	1.101	Entertainment	41%	1.000	1.421	1.000	-	-	-
				Laundry, beauty and bath services	19%	1.282	1.782	1.158	Hair dressing/beauty services	86%	1.164
									Laundry	14%	1.122
				Other services for individuals	28%	1.167	1.409	1.119	Electricity, gas, heat supply, sewerage and water distribution/pipe repairs & management	-	1.119
				Other (non-profit)	10%	1.000	1.466	1.000	-	-	-
				Activities not elsewhere classified	2%	1.000	13.189	1.000	-	-	-

Sources: Each column shows:

(a) Japan's labor productivity in comparison with the US (US=1) in each sector estimated by Takizawa (2016), which are not adjusted for quality differences.

(b) Quality adjusted Japan-US labor productivity for each sector = (a) × (c).

I Adjustment term for each of Takizawa's sectors: the arithmetic mean of I weighted by (d).

(d) Weight 1: Value-added share of each sector within each of Takizawa's sectors. We get these data from the JIP Database 2015.

I Adjustment term for each JIP industry = (f) × (g).

(f) GO (gross output)/VA (value added) ratio derived from JIP Database 2015.

(g) Japan-US quality gap for each JIP industry: geometric average of (i) weighted by (h).

(h) Weight 2: Simple average of expenditure share of nominal household consumption for each of ICP basic headings in Japan and in the US. In the case of retail sector, we used retail margin of each retail activities. We get retail margin from Ministry of Economy, Trade and Industry, *Census of Commerce 2014*.

(i) Japan-US quality gap for each survey item estimated in section 5.

Figure 3. Quality Adjusted and Unadjusted Labor Productivity Gap between Japan and the US: 2010-2012 Average

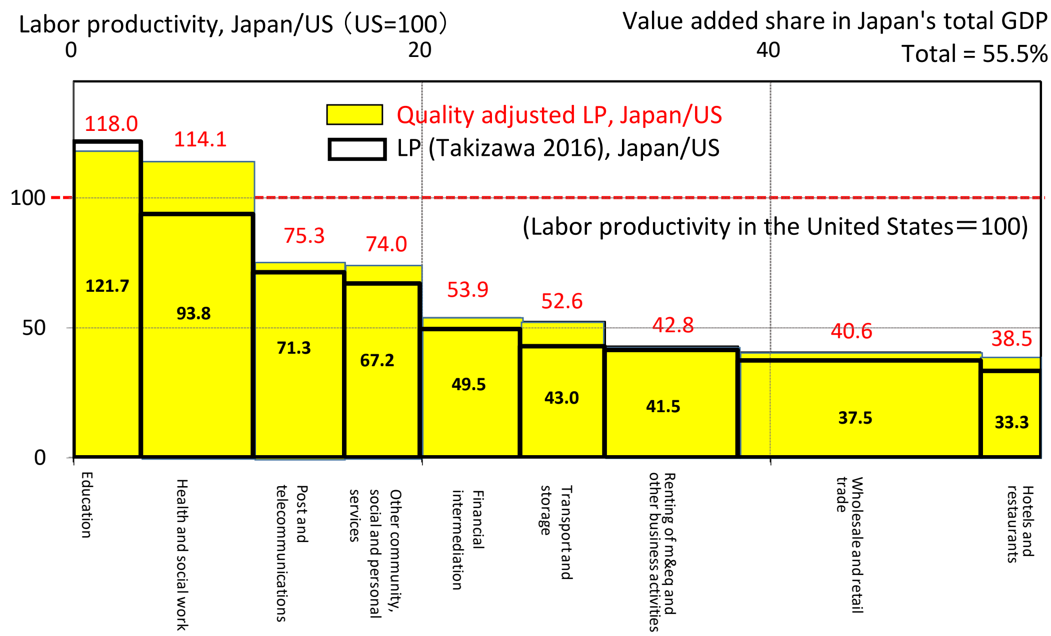


Figure 3 compares quality adjusted labor productivity gap (Japan/US) with quality unadjusted labor productivity gap. The horizontal axis denotes value added share of each sector in 2012. In all the sectors except education, quality adjusted labor productivity gap (Japan/US) is narrower than quality unadjusted labor quality gap. But even after our quality adjustment, in most of sectors Japan's labor productivity is still lower than the US.

7. Conclusions

In this paper, we tackle a fairly thorny issue of adjustment for quality differences in international comparisons of prices in the form of purchasing power parities from the International Comparison Program. While the survey framework including the selection of items and specifications of products has been well established, thus far the main focus of ICP has been on collecting prices of comparable products. Comparability of products heavily relies on the structural product descriptions associated with items to be priced. We argue in this paper that the use of SPDs is only a partial solution to the comparability problem and the current SPD structures, as illustrated in Section 2, leave scope for considerable quality differences of goods and services priced. In the presence of quality differences, the PPPs compiled as a part of the ICP at the World Bank cannot be considered as estimates of price level differences only. We develop an analytical framework based on consumers' willingness to pay for higher quality and the use of Sato-Vartia index to derived quality adjusted PPPs for a bilateral Japan-USA Comparison. The estimates of willingness to pay are based on data collected through a specialized survey conducted where the respondents are visitors to these countries who spend reasonable length of time to provide reliable estimates of willingness to pay (Section 4). Based on a rigorous econometric analysis of data collected, we find that there is a 9 percent premium for higher quality of services in Japan. The PPP for the services sector reduces from 113 JPY per

US dollar to 104 JPY. These results have a significant impact on labor productivity comparisons between Japan and USA.

We believe this study is the first of its kind and that it is likely to be create research focus on the problem of adjusting for quality differences in the compilation of PPPs from the ICP. While this a longer term goal, we made a significant start and expect further research to follow in this direction.

References

Carlsson, Fredrik and Peter Martinsson (2001) "Willingness to pay for reduction in air pollution: a multilevel analysis, " Environmental Economics and Policy Studies, Volume 4, Issue 1, pp. 17-27.

Crawford, Ian and J. Peter Neary (2008). "Testing for a Reference Consumer in International Comparisons of Living Standards,"American Economic Review, American Economic Association, vol. 98(4), pp.1731-1732.

Diewert, W. Erwin (1976) "Exact and Superlative Index Numbers," Journal of Econometrics, 4, pp.115-145.

Feenstra, Robert C. (1994) "New Product Varieties and the Measurement of International Prices," American Economic Review, 84(1), pp.157-177.

Hasan, Fadi (2016) "The price of development: The Penn-Balassa-Samuelson effect revisited," Journal of International Economics, vol. 102, issue C, pp.291-309.

Heckman, James J. (1979) "Sample selection bias as a specification error," Econometrica, 47, pp. 153–161.

Henson, Mary F. (1967). "Trends in the income of families and persons in the United States, 1947-1964," U. S. Dept. of Commerce, Bureau of the Census.

Inklaar, Robert and Marcel P. Timmer (2008) "GGDC Productivity Level Database: International Comparisons of Output, Inputs and Productivity at the Industry Level," GGDC Research Memorandum, GD-104, Groningen Growth and Development Centre, University of Groningen.

Inklaar, Robert and Marcel P. Timmer (2013) "Using Expenditure PPPs for Sectoral Output and Productivity Comparisons," Chapter 24 in World Bank (ed) Measuring the Real Size of the World Economy, World Bank, Washington DC. pp. 13-45.

Jorgenson, Dale. W., Koji Nomura, and Jon D. Samuels (2016) "A Half Century of Trans-Pacific Competition: Price Level Indexes and Productivity Gaps for Japanese and U.S. Industries, 1955–2012," in Dale W. Jorgenson, Kyoji Fukao, and Marcel P. Timmer, eds., Growth and Stagnation in the World Economy, Cambridge University Press.

Konus, A. (1924) "The Problem of the True Index of the Cost of Living," translated in Econometrica (1939), 7, pp. 10-29.

Milanovic, Branko (2002) "True world income distribution, 1988 and 1993: First calculations based on household surveys alone," Economic Journal 112 (476), January: 51-92.

Milanovic, Branko (2009) "Global inequality recalculated: the effect of new 2005 PPP estimates on global inequality," World Bank Working Paper No. 506.

Ministry of Economy, Trade and Industries (2013) White Paper on International Economy and Trade, Ministry of Economy, Trade and Industries.

Neary, J. Peter (2004) "Rationalizing the Penn World Table: True Multilateral Indices for International Comparisons of Real Income," American Economic Review, 94(5), pp.1411-1428.

Nomura, Koji and Miyagawa Kozo (2015) "The Japan-U.S. Price Level Index for Industry Outputs," *RIETI Discussion Paper Series*, no. 15-E-059, Research Institute of Economy, Trade and Industry, downloaded from https://www.rieti.go.jp/jp/publications/dp/15e059.pdf, on February 8, 2018.

Qiu, Dong (2016), "Some thoughts on PPP methods applied in China", II International Conference on Sub-national PPPs, and Real GDP and Living Condition Comparisons, Nanchang, China, 13-14, October.

Rao, D.S. Prasada, (2013) "The Framework for the International Comparison Program (ICP)", Chapter 1 in World Bank (ed) Measuring the Real Size of the World Economy, World Bank, Washington DC. pp. 13-45.

Sato, Kazuo (1976) "The Ideal Log-Change Index Number," Review of Economics and Statistics, 58(2), pp.223- 228.

Takizawa, Miho (2016) "Japan-US Comparison of Labor Productivity Level by Sector," Japan Productivity Center, *Productivity Report*, vol. 2.

Tsukada, Takeshige (2017) "ICP (International Comparison Program): How to Compromise between the Geographical and Cultural Differences of Goods/Services (in Japanese)," Statistics Bureau, Ministry of Internal Affairs and Communications, *Statistics Today*, No.117, downloaded from http://www.stat.go.jp/info/today/117.htm, on July 24, 2017.

Vartia, Yrjo (1976) "Ideal Log-Change Index Numbers," Scandinavian Journal of Statistics, 3(3), 121-126.

Vogel, F. (2013), The ICP Survey Framework, Chapter 7, in World Bank (ed) Measuring the Real Size of the World Economy, World Bank, Washington DC.

von Hippel, Paul T., Samuel V. Scarpino, and Igor Holas (2016) "Robust estimation of inequality from binned incomes," Sociological Methodology ,Vol. 46(1), pp.212–251.

Vartia, Yrjo (1976) "Ideal Log-Change Index Numbers," Scandinavian Journal of Statistics, 3(3), pp.121-126.

Vlachokostas,Christos, Charisios Achillas, Theodora Slini, Nicolas Moussiopoulos, Georgios Banias,and Ioannis Dimitrakis (2011) "Willingness to pay for reducing the risk of premature mortality attributed to air pollution: a contingent valuation study for Greece," Atmospheric Pollution Research,Volume 2, Issue 3, pp. 275-282,

World Bank, (2013) Measuring the Real Size of the World Economy: The Framework, Methodology, and Results of the International Comparison Program – ICP (The World Bank, Washington DC).

World Bank, (2015) Purchasing Power Parities and Real Expenditures of World Economies: Summary of Results and Findings of the 2011 International Comparison Program (The World Bank, Washington DC).

Zhang, Qi (2017) "The Balassa-Samuelson relationship: Services, manufacturing and product quality," Journal of International Economics, vol. 106, issue C, pp.55-82.

Appendix Table 1: OLS with Japan Sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
female	-0.0359+	-0.0504+	-0.0188	-0.0254	-0.0320	-0.0120	-0.0124	0.00707	-0.0466*	-0.0153	-0.0477*	-0.0168	0.0241	0.0105
	(0.0204)	(0.0260)	(0.0366)	(0.0213)	(0.0289)	(0.0204)	(0.0235)	(0.0205)	(0.0208)	(0.0207)	(0.0198)	(0.0208)	(0.0226)	(0.0330)
marriednew	-0.000996	-0.0135	0.0423	-0.00243	-0.0180	0.0471+	0.0218	0.0475+	0.0301	0.0580*	-0.00374	0.0282	0.0290	-0.0101
	(0.0249)	(0.0311)	(0.0528)	(0.0281)	(0.0349)	(0.0261)	(0.0328)	(0.0288)	(0.0272)	(0.0281)	(0.0262)	(0.0274)	(0.0284)	(0.0424)
age	-0.00122	-0.00399	-0.00301	-0.00817	-0.0116	0.00416	-0.0130+	-0.00512	-0.00511	0.000566	0.00572	-0.00625	-0.00377	0.00114
	(0.00615)	(0.00767)	(0.0108)	(0.00611)	(0.00776)	(0.00602)	(0.00662)	(0.00583)	(0.00622)	(0.00615)	(0.00699)	(0.00660)	(0.00701)	(0.00900)
age squared	0.0000266	0.0000478	0.0000524	0.000101	0.000144	-0.0000517	0.000140+	0.0000589	0.0000500	-0.0000126	-0.0000694	0.0000548	0.0000312	-0.0000194
	(0.0000671)	(0.0000853)	(0.000116)	(0.0000671)	(0.0000878)	(0.0000685)	(0.0000750)	(0.0000632)	(0.0000686)	(0.0000685)	(0.0000772)	(0.0000729)	(0.0000784)	(0.0000996)
ln(family size)	0.0451*	0.0628*	0.0317	0.0395+	0.0668*	0.00441	0.0204	0.0215	0.00628	-0.00295	-0.0102	-0.0176	-0.00907	0.0272
	(0.0219)	(0.0267)	(0.0399)	(0.0221)	(0.0306)	(0.0220)	(0.0268)	(0.0220)	(0.0233)	(0.0247)	(0.0224)	(0.0246)	(0.0248)	(0.0368)
university graduate	-0.0305	-0.0347	-0.0807*	-0.00341	-0.0436	-0.0330	-0.00738	0.000528	0.00440	-0.0140	-0.00914	-0.0372	-0.00200	0.00965
	(0.0236)	(0.0289)	(0.0397)	(0.0227)	(0.0322)	(0.0218)	(0.0260)	(0.0225)	(0.0237)	(0.0231)	(0.0231)	(0.0245)	(0.0258)	(0.0373)
ln(household income)	-0.0293+	-0.00815	-0.0207	-0.0132	-0.0142	-0.00482	-0.0166	-0.0219	-0.0158	-0.0190	0.0144	0.0103	0.0207	0.0201
	(0.0154)	(0.0208)	(0.0255)	(0.0159)	(0.0238)	(0.0144)	(0.0148)	(0.0133)	(0.0148)	(0.0176)	(0.0158)	(0.0150)	(0.0179)	(0.0266)
constant	1.366**	1.246**	1.312**	1.368**	1.435**	1.106**	1.546**	1.339**	1.319**	1.208**	0.886**	1.156**	1.029**	0.844**
	(0.156)	(0.221)	(0.278)	(0.156)	(0.192)	(0.153)	(0.162)	(0.142)	(0.160)	(0.167)	(0.177)	(0.166)	(0.177)	(0.260)
N	418	296	180	387	244	442	349	431	452	410	449	450	408	273
ll	84.32	50.05	17.27	73.68	29.89	74.59	55.39	71.98	60.32	71.09	73.87	54.00	43.66	0.930
r2	0.0352	0.0343	0.0503	0.0191	0.0417	0.0188	0.0170	0.0189	0.0184	0.0173	0.0175	0.0129	0.0127	0.0115
F	2.363	1.627	1.342	1.295	1.522	1.710	0.868	1.299	1.315	1.051	1.063	0.882	0.703	0.395

	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)
female	-0.00276	-0.0105	-0.00834	-0.0345	0.0000198	-0.00389	-0.0179	0.0102	0.0279	0.0215	-0.0242	-0.00890	-0.00203	0.00254
	(0.0217)	(0.0231)	(0.0215)	(0.0329)	(0.0321)	(0.0218)	(0.0264)	(0.0270)	(0.0270)	(0.0280)	(0.0224)	(0.0309)	(0.0260)	(0.0533)
marriednew	-0.0210	-0.00955	-0.000463	0.00967	-0.00594	0.00710	-0.00311	-0.0292	-0.0283	-0.0207	0.0180	0.00478	-0.0450	0.0398
	(0.0276)	(0.0291)	(0.0248)	(0.0409)	(0.0399)	(0.0288)	(0.0347)	(0.0314)	(0.0357)	(0.0420)	(0.0294)	(0.0407)	(0.0340)	(0.0716)
age	-0.000132	-0.0203**	-0.0126*	-0.0164	-0.0120	-0.00628	-0.0205*	-0.0208**	-0.00133	-0.0174*	-0.0105	-0.00490	-0.00942	-0.0217
	(0.00621)	(0.00711)	(0.00635)	(0.00997)	(0.0105)	(0.00638)	(0.00814)	(0.00763)	(0.00692)	(0.00764)	(0.00775)	(0.00906)	(0.00788)	(0.0173)
age squared	-0.00000642	0.000219**	0.000146*	0.000196+	0.000150	0.0000682	0.000215*	0.000233**	0.0000165	0.000198*	0.000123	0.0000773	0.0000987	0.000230
	(0.0000695)	(0.0000812)	(0.0000705)	(0.000112)	(0.000118)	(0.0000698)	(0.0000919)	(0.0000871)	(0.0000779)	(0.0000846)	(0.0000863)	(0.000100)	(0.0000882)	(0.000207)
ln(family size)	-0.00397	0.000779	0.0379	0.0293	-0.00141	0.0223	0.0319	0.0634*	0.0459	0.0270	0.0464+	0.0354	0.0496+	0.0505
	(0.0253)	(0.0264)	(0.0244)	(0.0361)	(0.0400)	(0.0249)	(0.0307)	(0.0290)	(0.0319)	(0.0338)	(0.0268)	(0.0316)	(0.0292)	(0.0561)
university graduate	-0.0193	-0.0447+	-0.000111	-0.0261	0.00948	-0.0201	0.0655*	0.00461	0.0166	0.00875	-0.0169	-0.0134	-0.0167	-0.0419
	(0.0232)	(0.0270)	(0.0245)	(0.0405)	(0.0380)	(0.0237)	(0.0290)	(0.0300)	(0.0272)	(0.0282)	(0.0260)	(0.0350)	(0.0299)	(0.0668)
ln(household income)	0.0170	0.0117	-0.0121	-0.0638**	-0.000468	-0.00182	-0.00873	-0.0181	-0.0297+	-0.00504	-0.0266+	-0.0195	0.0000554	-0.0762*
	(0.0181)	(0.0196)	(0.0145)	(0.0241)	(0.0231)	(0.0162)	(0.0187)	(0.0153)	(0.0179)	(0.0199)	(0.0152)	(0.0215)	(0.0201)	(0.0339)
constant	1.020**	1.509**	1.396**	1.849**	1.369**	1.280**	1.552**	1.622**	1.335**	1.511**	1.452**	1.278**	1.182**	1.911**
	(0.168)	(0.195)	(0.159)	(0.249)	(0.245)	(0.159)	(0.194)	(0.181)	(0.182)	(0.209)	(0.193)	(0.229)	(0.210)	(0.389)
N	397	348	368	172	300	382	272	270	306	273	293	241	396	144
ll	70.31	55.58	78.16	32.67	-28.94	72.19	57.29	53.50	39.57	37.64	81.40	31.88	-7.859	-29.22
r2	0.00780	0.0371	0.0203	0.0915	0.0114	0.00752	0.0617	0.0486	0.0200	0.0254	0.0373	0.0210	0.0156	0.0756
F	0.315	1.893	0.985	2.300	0.379	0.394	3.294	1.959	0.880	1.004	1.546	0.775	0.865	1.412

Note: Standard errors in parentheses

+ p<0.1, * p<0.05, ** p<0.01

For the correspondence between the number and the service items, please refer Table 2

Appendix Table 2: OLS with the US Sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
female	0.0560	-0.0156	0.0357	0.0628	-0.0355	-0.0211	0.0538	-0.0570	-0.0259	-0.00445	-0.0505	-0.0851+	-0.0161	-0.0382
	(0.0441)	(0.0490)	(0.0772)	(0.0450)	(0.0541)	(0.0365)	(0.0540)	(0.0380)	(0.0380)	(0.0395)	(0.0398)	(0.0468)	(0.0399)	(0.0486)
marriednew	-0.0797	-0.0570	-0.151	-0.0209	-0.0942	-0.0673	-0.0274	-0.0609	-0.0554	-0.0345	-0.0636	-0.0322	-0.0804	-0.0991
	(0.0631)	(0.0723)	(0.107)	(0.0614)	(0.0767)	(0.0575)	(0.0780)	(0.0603)	(0.0568)	(0.0587)	(0.0530)	(0.0643)	(0.0520)	(0.0745)
age	0.0161	0.0118	0.00306	0.00891	0.000601	0.0132	0.0404+	0.00631	0.00646	0.0217+	0.0120	0.0168	0.00821	-0.00463
	(0.0138)	(0.0163)	(0.0217)	(0.0126)	(0.0168)	(0.0119)	(0.0234)	(0.0119)	(0.0127)	(0.0125)	(0.0121)	(0.0138)	(0.0122)	(0.0147)
age squared	-0.000194	-0.000165	-0.0000226	-0.0000911	-0.0000290	-0.000210	-0.000522+	-0.000116	-0.000117	-0.000303*	-0.000207	-0.000250	-0.000155	-0.0000175
	(0.000165)	(0.000198)	(0.000272)	(0.000151)	(0.000203)	(0.000143)	(0.000311)	(0.000146)	(0.000156)	(0.000150)	(0.000143)	(0.000171)	(0.000144)	(0.000172)
ln(family size)	0.00329	0.0214	0.114	-0.0225	-0.0295	-0.0308	-0.00808	-0.0222	-0.0117	-0.0429	-0.0239	-0.00197	-0.00275	-0.0372
	(0.0510)	(0.0641)	(0.0816)	(0.0506)	(0.0631)	(0.0451)	(0.0565)	(0.0480)	(0.0468)	(0.0478)	(0.0444)	(0.0539)	(0.0449)	(0.0662)
university graduate	0.0577	0.0327	-0.0259	0.0552	-0.00388	0.0101	-0.00764	-0.0323	-0.0270	-0.0105	0.0137	-0.0265	0.00589	0.0338
	(0.0459)	(0.0472)	(0.0768)	(0.0470)	(0.0599)	(0.0398)	(0.0503)	(0.0408)	(0.0408)	(0.0418)	(0.0429)	(0.0518)	(0.0403)	(0.0498)
ln(household income)	0.0367	0.0560+	-0.0495	-0.0266	0.0834*	0.0473+	0.000401	0.0418+	0.0218	0.0254	0.0439	0.0597	0.0283	0.0269
	(0.0306)	(0.0292)	(0.0478)	(0.0317)	(0.0386)	(0.0256)	(0.0334)	(0.0247)	(0.0261)	(0.0265)	(0.0286)	(0.0384)	(0.0305)	(0.0325)
constant	0.261	0.215	1.473*	1.179**	0.214	0.404	0.330	0.635*	0.810*	0.483	0.513	0.208	0.709*	1.051**
	(0.399)	(0.405)	(0.644)	(0.356)	(0.461)	(0.340)	(0.481)	(0.296)	(0.334)	(0.329)	(0.334)	(0.451)	(0.349)	(0.366)
N	302	201	92	202	149	273	169	242	248	241	257	203	259	198
ll	-127.8	-63.19	-27.23	-49.10	-35.26	-51.39	-50.04	-43.43	-47.85	-52.95	-65.28	-56.51	-64.75	-57.57
r2	0.0547	0.0555	0.102	0.0203	0.0593	0.0407	0.0350	0.0317	0.0163	0.0251	0.0457	0.0438	0.0349	0.0412
F	2.333	1.691	1.493	0.598	1.543	1.793	0.854	1.502	0.640	1.100	1.897	1.592	1.419	1.304
	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)
female	0.0260	-0.0175	0.0149	-0.159*	-0.0266	-0.0167	-0.00263	-0.0689	-0.0308	-0.0927*	-0.0263	0.0272	-0.0156	-0.0557
	(0.0461)	(0.0559)	(0.0385)	(0.0800)	(0.0662)	(0.0645)	(0.0556)	(0.0448)	(0.0593)	(0.0451)	(0.0451)	(0.0549)	(0.0413)	(0.0766)
marriednew	-0.0941	-0.128+	-0.0375	-0.0136	-0.0623	-0.179+	-0.0760	-0.0964+	-0.103	-0.0641	-0.0701	-0.0669	-0.0619	-0.125
	(0.0676)	(0.0755)	(0.0514)	(0.103)	(0.0941)	(0.0989)	(0.0792)	(0.0562)	(0.0843)	(0.0617)	(0.0608)	(0.0714)	(0.0598)	(0.108)
age	0.00328	0.00452	-0.00991	0.0333	0.0341	0.00637	0.0231	0.00989	0.00850	0.0216	0.000946	0.0250	0.0141	-0.0489
	(0.0165)	(0.0191)	(0.0132)	(0.0304)	(0.0232)	(0.0182)	(0.0182)	(0.0151)	(0.0238)	(0.0160)	(0.0148)	(0.0216)	(0.0136)	(0.0296)
age squared	-0.0000981	-0.000100	0.0000717	-0.000532	-0.000494+	-0.000158	-0.000356+	-0.000210	-0.000125	-0.000354+	-0.0000629	-0.000367	-0.000224	0.000667+
	(0.000198)	(0.000234)	(0.000159)	(0.000417)	(0.000293)	(0.000217)	(0.000215)	(0.000185)	(0.000304)	(0.000208)	(0.000181)	(0.000289)	(0.000159)	(0.000380)
ln(family size)	-0.0293	-0.0380	-0.0236	0.0475	-0.0894	-0.0787	0.0258	-0.0118	-0.0662	-0.0485	-0.0529	-0.0487	-0.0589	-0.0350
	(0.0544)	(0.0583)	(0.0426)	(0.0797)	(0.0642)	(0.0801)	(0.0672)	(0.0520)	(0.0670)	(0.0567)	(0.0489)	(0.0636)	(0.0478)	(0.0896)
university graduate	0.0237	-0.0279	-0.0297	0.0346	-0.0667	-0.0137	0.0838	-0.00283	-0.0136	-0.0759	-0.00466	0.0171	0.0309	0.0730
	(0.0486)	(0.0512)	(0.0384)	(0.0768)	(0.0642)	(0.0621)	(0.0547)	(0.0458)	(0.0630)	(0.0486)	(0.0462)	(0.0578)	(0.0422)	(0.0720)
ln(household income)	0.0338	0.0625+	0.0569*	0.0694	0.0681+	0.0885*	0.0310	0.0618+	0.0224	0.0861**	0.0423	0.0307	0.0267	0.0541
	(0.0349)	(0.0329)	(0.0270)	(0.0458)	(0.0379)	(0.0423)	(0.0383)	(0.0337)	(0.0407)	(0.0324)	(0.0345)	(0.0367)	(0.0322)	(0.0468)
constant	0.756+	0.442	0.739*	-0.139	-0.0801	0.206	0.346	0.366	0.817	-0.0107	0.768*	0.397	0.681+	1.436**
	(0.390)	(0.364)	(0.353)	(0.677)	(0.507)	(0.472)	(0.496)	(0.401)	(0.493)	(0.401)	(0.373)	(0.450)	(0.372)	(0.542)
N	196	150	227	91	105	146	164	198	143	195	203	146	217	107
ll	-49.41	-33.13	-34.62	-28.51	-27.78	-60.25	-49.11	-44.19	-48.12	-44.86	-40.19	-38.77	-40.20	-37.71
r2	0.0382	0.0591	0.0346	0.111	0.0727	0.0719	0.0994	0.0786	0.0161	0.0732	0.0267	0.0373	0.0357	0.0794
F	1.008	1.733	1.072	1.444	1.418	1.905	2.864	2.659	0.339	2.522	0.686	0.933	1.338	1.764

Note: Standard errors in parentheses
+ p<0.1, * p<0.05, ** p<0.01
For the correspondence between the number and the service items, please refer Table2

Appendix Table 3-1: The Estimation Results of the Sample Selection Models by Heckman for Japan Sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Main Equation														
Female	-0.0432*	-0.0558*	-0.0220	-0.0249	-0.0307	-0.0167	-0.0113	0.00168	-0.0595**	-0.0210	-0.0548**	-0.0199	0.0273	0.0146
	(0.0183)	(0.0238)	(0.0391)	(0.0186)	(0.0282)	(0.0206)	(0.0236)	(0.0218)	(0.0209)	(0.0260)	(0.0196)	(0.0258)	(0.0229)	(0.0391)
Married	-0.0102	-0.00869	0.0456	-0.000669	-0.0257	0.0495+	0.0222	0.0578+	0.0358	0.0597*	-0.00612	0.0272	0.0286	-0.00833
	(0.0223)	(0.0269)	(0.0648)	(0.0286)	(0.0322)	(0.0279)	(0.0304)	(0.0318)	(0.0289)	(0.0233)	(0.0292)	(0.0243)	(0.0253)	(0.0435)
age	0.000174	-0.00263	-0.00205	-0.00847	-0.0129	0.00275	-0.0125	-0.00579	-0.00694	-0.000313	0.00168	-0.00342	-0.00846	0.000653
	(0.00660)	(0.00830)	(0.0137)	(0.00780)	(0.00886)	(0.00669)	(0.00869)	(0.00589)	(0.00590)	(0.00610)	(0.00753)	(0.00731)	(0.00726)	(0.00803)
age squared	0.0000172	0.0000319	0.0000408	0.000104	0.000158	-0.0000384	0.000134	0.0000636	0.0000657	-0.00000349	-0.0000246	0.0000240	0.0000795	-0.0000113
	(0.0000734)	(0.0000899)	(0.000149)	(0.0000858)	(0.0000985)	(0.0000769)	(0.000102)	(0.0000663)	(0.0000641)	(0.0000644)	(0.0000824)	(0.0000792)	(0.0000793)	(0.0000913)
ln (family size)	0.0454+	0.0616*	0.0313	0.0397+	0.0687*	0.00626	0.0202	0.0200	0.0137	0.000888	-0.00101	-0.0174	-0.0206	0.0274
	(0.0250)	(0.0306)	(0.0334)	(0.0226)	(0.0338)	(0.0285)	(0.0313)	(0.0252)	(0.0255)	(0.0237)	(0.0245)	(0.0235)	(0.0270)	(0.0325)
univeristy graduate	-0.0184	-0.0366	-0.0835*	-0.00539	-0.0372	-0.0292	-0.00718	-0.00398	0.00496	-0.0155	-0.0103	-0.0348	0.00425	0.0124
	(0.0284)	(0.0253)	(0.0360)	(0.0274)	(0.0327)	(0.0240)	(0.0302)	(0.0231)	(0.0271)	(0.0233)	(0.0218)	(0.0280)	(0.0285)	(0.0379)
ln (household income)	-0.0226	-0.00403	-0.0190	-0.0145	-0.0105	-0.00879	-0.0160	-0.0225	-0.0183	-0.0217	0.0103	0.0120	0.0131	0.0256
	(0.0185)	(0.0233)	(0.0299)	(0.0166)	(0.0255)	(0.0143)	(0.0146)	(0.0161)	(0.0134)	(0.0160)	(0.0161)	(0.0171)	(0.0224)	(0.0297)
constant	1.262**	1.168**	1.264**	1.386**	1.411**	1.173**	1.530**	1.384**	1.390**	1.253**	1.006**	1.071**	1.236**	0.791**
	(0.172)	(0.249)	(0.341)	(0.241)	(0.231)	(0.163)	(0.217)	(0.152)	(0.163)	(0.179)	(0.201)	(0.207)	(0.234)	(0.273)
Selection Equation														
fluency in English	0.539**	0.380*	0.444*	0.322+	0.430**	0.420	0.525**	-0.0224	0.399	0.379*	0.147	-0.190	-0.0767	0.241
	(0.204)	(0.159)	(0.184)	(0.175)	(0.152)	(0.305)	(0.145)	(0.252)	(2.133)	(0.189)	(0.331)	(0.261)	(0.182)	(0.150)
Female	-0.313	-0.188	-0.131	-0.191	0.174	0.100	0.337+	0.264	0.361	0.470*	0.214	-0.185	-0.0136	0.503**
	(0.265)	(0.166)	(0.206)	(0.182)	(0.172)	(0.226)	(0.184)	(0.231)	(14.73)	(0.190)	(0.250)	(0.315)	(0.212)	(0.194)
married	-0.480+	0.237	0.329	-0.514*	-0.388*	-0.0710	0.125	-0.350	-0.577	-0.236	0.228	0.0709	0.0279	0.207
	(0.253)	(0.201)	(0.220)	(0.240)	(0.191)	(0.376)	(0.256)	(0.390)	(1.835)	(0.220)	(0.250)	(0.392)	(0.219)	(0.189)
age	-0.00114	0.00230	0.0440	0.0873	-0.0832+	0.135+	0.113**	0.0129	0.0882	0.0289	0.242**	0.132	0.0456	-0.0993*
	(0.0691)	(0.0365)	(0.0402)	(0.0532)	(0.0463)	(0.0805)	(0.0427)	(0.0552)	(1.334)	(0.0569)	(0.0780)	(0.0849)	(0.0454)	(0.0429)
age squared	0.000306	-0.0000637	-0.000473	-0.000928+	0.000922+	-0.00145+	-0.00146**	-0.000114	-0.000692	-0.000265	-0.00273**	-0.00143	-0.000424	0.00130**
	(0.000783)	(0.000422)	(0.000457)	(0.000553)	(0.000507)	(0.000859)	(0.000474)	(0.000595)	(0.0151)	(0.000600)	(0.000846)	(0.000938)	(0.000497)	(0.000480)
ln (household income)	0.254+	0.131	0.0421	0.247+	-0.0618	0.372+	0.174	0.0143	0.224	0.239+	0.294+	0.0639	0.133	0.328**
	(0.144)	(0.107)	(0.0998)	(0.135)	(0.102)	(0.220)	(0.142)	(0.127)	(0.296)	(0.136)	(0.157)	(0.147)	(0.102)	(0.110)
lnfamsize	0.179	-0.0814	-0.0216	0.0286	0.271*	-0.165	-0.0884	0.100	-0.578	-0.391+	-0.546+	0.00988	0.232+	0.129
	(0.192)	(0.152)	(0.216)	(0.183)	(0.136)	(0.337)	(0.167)	(0.227)	(5.899)	(0.203)	(0.316)	(0.329)	(0.138)	(0.154)

Appendix Table 3-2: The Estimation Results of the Sample Selection Models by Heckman for Japan Sample

	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)
Main Equation														
Female	-0.00343	-0.0170	-0.00869	-0.0350	0.0111	-0.00461	-0.0173	0.00873	0.0262	0.0198	-0.0270	-0.00984	0.0274	0.00807
	(0.0197)	(0.0249)	(0.0225)	(0.0286)	(0.0378)	(0.0219)	(0.0233)	(0.0267)	(0.0238)	(0.0241)	(0.0226)	(0.0329)	(0.0274)	(0.0528)
Married	-0.0143	-0.0179	-0.000174	0.00864	0.00225	0.00710	-0.00409	-0.0309	-0.0290	-0.0191	0.0206	0.00859	-0.0437	0.0387
	(0.0329)	(0.0341)	(0.0256)	(0.0390)	(0.0365)	(0.0299)	(0.0338)	(0.0311)	(0.0363)	(0.0443)	(0.0265)	(0.0421)	(0.0374)	(0.0911)
age	0.00138	-0.0180*	-0.0129*	-0.0168	-0.00671	-0.00634	-0.0210*	-0.0225*	-0.00207	-0.0170+	-0.0120	0.00124	-0.00573	-0.0244
	(0.00757)	(0.00748)	(0.00576)	(0.0107)	(0.0103)	(0.00759)	(0.00853)	(0.0106)	(0.00765)	(0.00879)	(0.00915)	(0.0103)	(0.00853)	(0.0219)
age squared	-0.0000214	0.000193*	0.000149*	0.000201+	0.0000911	0.0000688	0.000221*	0.000252*	0.0000238	0.000194*	0.000139	0.0000101	0.0000614	0.000247
	(0.0000826)	(0.0000862)	(0.0000669)	(0.000118)	(0.000120)	(0.0000842)	(0.0000978)	(0.000120)	(0.0000840)	(0.0000909)	(0.000101)	(0.000112)	(0.0000923)	(0.000261)
ln (family size)	-0.00894	-0.000644	0.0386	0.0302	0.00286	0.0222	0.0318	0.0610*	0.0469	0.0275	0.0469+	0.0421	0.0383	0.0407
	(0.0274)	(0.0273)	(0.0245)	(0.0359)	(0.0418)	(0.0265)	(0.0347)	(0.0303)	(0.0346)	(0.0392)	(0.0265)	(0.0323)	(0.0292)	(0.0667)
univeristy graduate	-0.0140	-0.0445	-0.00114	-0.0264	0.0110	-0.0205	0.0646*	0.00382	0.0138	0.00672	-0.0158	-0.0153	-0.00466	-0.0303
	(0.0270)	(0.0300)	(0.0278)	(0.0433)	(0.0407)	(0.0247)	(0.0289)	(0.0250)	(0.0290)	(0.0263)	(0.0250)	(0.0351)	(0.0301)	(0.0757)
ln (household income)	0.0186	0.0122	-0.0128	-0.0645*	0.00313	-0.00188	-0.0100	-0.0213	-0.0317	-0.00249	-0.0293+	-0.0150	0.0106	-0.0697+
	(0.0160)	(0.0182)	(0.0116)	(0.0261)	(0.0267)	(0.0188)	(0.0182)	(0.0172)	(0.0223)	(0.0185)	(0.0168)	(0.0231)	(0.0198)	(0.0395)
constant	0.956**	1.447**	1.411**	1.870**	1.182**	1.283**	1.578**	1.703**	1.377**	1.469**	1.519**	1.064**	0.968**	1.876**
	(0.204)	(0.194)	(0.134)	(0.302)	(0.284)	(0.189)	(0.257)	(0.284)	(0.259)	(0.265)	(0.275)	(0.279)	(0.200)	(0.483)
Selection Equation														
fluency in English	0.290+	-0.0342	0.401*	0.203	0.537**	0.500*	0.286+	0.588**	0.396*	0.305*	0.355*	0.641**	0.336	0.787**
	(0.166)	(0.147)	(0.194)	(0.160)	(0.186)	(0.195)	(0.149)	(0.123)	(0.162)	(0.150)	(0.142)	(0.205)	(0.213)	(0.236)
Female	0.128	-0.359*	0.158	0.190	0.377+	0.579**	-0.0567	0.117	0.306+	-0.0528	0.137	-0.227	0.624*	0.273
	(0.213)	(0.170)	(0.205)	(0.174)	(0.192)	(0.157)	(0.199)	(0.162)	(0.169)	(0.186)	(0.181)	(0.169)	(0.282)	(0.213)
married	0.352	-0.358*	0.0315	0.376*	0.189	0.0601	0.143	0.117	0.259	0.159	-0.118	-0.0142	0.0707	0.246
	(0.269)	(0.175)	(0.243)	(0.184)	(0.240)	(0.236)	(0.196)	(0.203)	(0.210)	(0.176)	(0.235)	(0.237)	(0.272)	(0.230)
age	0.0616	0.115**	0.0689	0.0933+	0.111**	0.00203	0.0282	0.0907+	0.0732	0.00891	0.0777	0.0726	0.0594	-0.0336
	(0.0485)	(0.0404)	(0.0662)	(0.0481)	(0.0428)	(0.0521)	(0.0422)	(0.0497)	(0.0467)	(0.0408)	(0.0488)	(0.0462)	(0.0476)	(0.0501)
age squared	-0.000529	-0.00127**	-0.000678	-0.00105*	-0.00127**	0.0000838	-0.000321	-0.00104+	-0.000696	0.00000208	-0.000779	-0.000799	-0.000586	0.000257
	(0.000524)	(0.000440)	(0.000723)	(0.000515)	(0.000475)	(0.000562)	(0.000468)	(0.000550)	(0.000511)	(0.000449)	(0.000527)	(0.000494)	(0.000513)	(0.000539)
ln (household income)	-0.000881	0.0000194	0.111	0.0406	0.108	0.0251	0.147+	0.153+	0.186+	0.120	0.151	0.0370	0.108	0.0448
	(0.108)	(0.0985)	(0.115)	(0.0788)	(0.0991)	(0.132)	(0.0851)	(0.0926)	(0.100)	(0.102)	(0.101)	(0.123)	(0.0879)	(0.131)
lnfamsize	-0.124	-0.113	-0.0549	-0.230	0.101	0.123	0.0648	0.151	-0.0304	0.0649	-0.0697	0.101	-0.132	-0.124
	(0.238)	(0.123)	(0.173)	(0.154)	(0.168)	(0.162)	(0.138)	(0.176)	(0.138)	(0.151)	(0.153)	(0.140)	(0.203)	(0.177)

Appendix Table 3-3: The Estimation Results of the Sample Selection Models by Heckman for Japan Sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
							Selection Equation							
2.edu	1.782	-6.421**	-0.487	-4.784**	-6.604**	-3.670+	0.229	-4.647	-4.535	-5.035**	-4.404**	-4.432**	-4.442**	6.021**
	(4.551)	(0.481)	(4.061)	(0.407)	(0.394)	(2.163)	(4.903)	(7.501)	(10.71)	(0.662)	(0.821)	(0.832)	(0.480)	(0.730)
3.edu	1.789	-6.325**	-0.420	-4.689**	-6.191	-4.166	0.488	-4.420	-4.340	-5.137	-4.936**	0.609	-5.199	6.136**
	(21.40)	(0.734)	(4.003)	(0.468)	(21.21)	(6.337)	(34.78)	(13.04)	(14.42)	(3.276)	(1.247)	(12.83)	(14.99)	(0.774)
4.edu	2.005	-6.229**	-0.932	-4.652**	-6.389**	-4.430*	-0.0845	-4.566	-3.514	-4.704**	-4.572**	-4.174+	-4.152	6.440**
	(4.647)	(0.516)	(3.978)	(0.435)	(0.488)	(1.774)	(4.925)	(12.74)	(14.88)	(0.640)	(1.517)	(2.416)	(36.43)	(0.787)
5.edu	1.751	-5.889**	-0.746	-4.553**	-5.935**	-3.222	0.258	-4.956**	-4.152	-4.703**	-3.527	-4.431**	-4.856**	6.396**
	(4.694)	(0.472)	(4.045)	(0.400)	(0.412)	(9.587)	(4.848)	(0.615)	(16.26)	(0.680)	(7.147)	(0.686)	(0.454)	(0.802)
6.edu	2.056	-6.456**	-1.138	-4.351**	-6.041**	-4.252**	-0.0149	-4.527**	-4.228	-4.853**	-4.204**	-4.114**	-4.612**	6.416**
	(4.643)	(0.453)	(4.047)	(0.321)	(0.413)	(1.471)	(4.846)	(0.617)	(8.926)	(0.640)	(0.655)	(0.734)	(0.407)	(0.766)
7.edu	2.348	-6.333**	-0.496	-4.307**	-6.095**	-3.566	0.332	-4.639**	-2.814	-4.426**	-4.365**	-4.036	-4.874**	6.313**
	(4.757)	(0.493)	(3.991)	(0.408)	(0.443)	(5.460)	(4.838)	(0.626)	(11.99)	(0.672)	(0.771)	(2.723)	(0.489)	(0.773)
obj_siteseeing	-0.00903	-0.0116	-0.199	-0.0433	-0.000781	-0.231	-0.545**	0.0924	-0.652	-0.186	0.0849	0.140	-0.265	0.451**
	(0.221)	(0.158)	(0.167)	(0.168)	(0.167)	(0.303)	(0.155)	(0.274)	(0.897)	(0.183)	(0.215)	(0.316)	(0.168)	(0.157)
obj_business 1	0.247	0.517*	0.441**	-0.280	-0.0746	-0.801**	0.287	-0.371	-0.917	-0.107	-0.361	-0.248	0.134	0.108
	(0.263)	(0.217)	(0.140)	(0.222)	(0.184)	(0.243)	(0.232)	(0.274)	(9.837)	(0.232)	(0.368)	(0.354)	(0.188)	(0.197)
obj_business 2	-0.110	0.515**	0.426*	0.113	0.199	-0.0186	0.286	-0.210	-0.531	0.146	-0.437	-0.00135	0.0387	0.381*
	(0.269)	(0.176)	(0.183)	(0.203)	(0.161)	(0.357)	(0.194)	(0.238)	(5.373)	(0.265)	(0.364)	(0.325)	(0.218)	(0.179)
obj_business 3	-0.0217	0.130	-0.0670	0.455*	0.229	0.255	0.228	0.232	-0.265	-0.0771	-0.169	-0.154	-0.308	-0.121
	(0.276)	(0.204)	(0.171)	(0.223)	(0.180)	(0.360)	(0.204)	(0.196)	(3.530)	(0.235)	(0.371)	(0.312)	(0.216)	(0.209)
obj_student	0.179	0.0727	-0.0239	0.569*	0.164	0.0562	0.415	-0.166	0.184	-0.108	-0.153	0.483	0.177	-0.342*
	(0.255)	(0.181)	(0.196)	(0.256)	(0.157)	(0.399)	(0.255)	(0.280)	(5.564)	(0.244)	(0.455)	(0.626)	(0.259)	(0.171)
obj_voluntary	-0.184	0.0654	0.773*	-0.223	0.277	-0.956	-0.655+	0.0450	-0.279	-0.254	-0.363	-0.584	0.147	0.350
	(0.534)	(0.418)	(0.331)	(2.953)	(0.316)	(0.638)	(0.343)	(1.084)	(6.043)	(0.386)	(3.508)	(0.862)	(0.323)	(0.320)
obj_visiting friends	0.0584	-0.0189	-0.0314	0.230	0.153	0.580	0.0538	-0.260	0.337	-0.542+	0.362	-0.101	-0.164	-0.210
	(0.363)	(0.266)	(0.183)	(0.263)	(0.231)	(0.550)	(0.171)	(0.269)	(5.915)	(0.289)	(1.115)	(0.343)	(0.301)	(0.205)
obj_accampanying fam	-0.147	0.156	0.564*	-0.0473	0.121	-0.476	0.318	-0.0299	0.523	0.615+	-0.222	0.440	0.397	0.163
	(0.265)	(0.243)	(0.224)	(0.203)	(0.193)	(0.406)	(0.302)	(0.339)	(2.519)	(0.336)	(0.507)	(0.411)	(0.333)	(0.233)
obj_others	0.138	0.398	0.661+	-0.255	-0.581	14.56	1.081	10.94	11.85	10.11+	8.474	54.79**	0.465	0.574
	(5.103)	(0.463)	(0.399)	(4.299)	(0.395)	(16.54)	(2.342)	(32.56)	(8.449)	(5.604)	(5.605)	(15.82)	(6.337)	(0.400)
nominal exchange rate	0.000483	0.00823	-0.0119+	-0.00209	0.000964	0.0120	0.00652	0.0143+	0.00872	0.00427	0.0181**	0.0161+	0.00851+	0.00304
	(0.00687)	(0.00506)	(0.00641)	(0.00670)	(0.00472)	(0.00811)	(0.00555)	(0.00745)	(0.0491)	(0.00689)	(0.00653)	(0.00828)	(0.00516)	(0.00512)
1.jobclass	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
2.jobclass	0.340	-0.524	-0.0282	-0.0427	-0.437	0.541	-0.200	0.295	-0.752	-0.246	0.113	0.271	-0.198	-0.0439
	(12.59)	(0.338)	(0.484)	(0.472)	(0.290)	(4.203)	(0.466)	(5.076)	(2.845)	(0.462)	(4.419)	(14.68)	(0.329)	(0.422)
3.jobclass	-1.113**	-0.550	0.416	-0.419	-0.674*	0.630	-0.0351	-0.308	-0.354	-0.0285	0.00739	-0.0410	-0.654+	-0.434
	(0.431)	(0.389)	(0.412)	(0.367)	(0.320)	(1.221)	(0.414)	(3.110)	(8.482)	(0.408)	(0.478)	(1.084)	(0.336)	(0.391)
4.jobclass	0.133	0.179	0.286	0.258	-0.527*	0.770+	0.0587	-0.216	0.363	-0.149	-0.237	-0.408	-0.492	-0.282
	(0.284)	(0.249)	(0.251)	(0.255)	(0.223)	(0.461)	(0.255)	(0.350)	(6.373)	(0.329)	(0.360)	(0.482)	(0.313)	(0.224)
5.jobclass	-0.0873	-0.312	0.0941	0.0242	-0.303	0.595	0.161	0.0466	-0.175	0.340	0.110	0.0563	-0.152	-0.342+
	(0.240)	(0.201)	(0.241)	(0.234)	(0.256)	(1.542)	(0.242)	(0.357)	(9.678)	(0.308)	(0.425)	(0.342)	(0.240)	(0.201)
constant	-3.048	4.460**	-0.283	2.050	7.797**	-1.034	-3.795	4.234*	2.495	3.390+	-2.152	1.046	2.944*	-7.812**
	(4.469)	(1.109)	(4.194)	(1.880)	(1.333)	(3.633)	(5.028)	(1.679)	(59.54)	(2.002)	(2.042)	(2.315)	(1.380)	(1.249)
mills ratio	0.0934	0.0461	0.0222	-0.0118	0.0364	-0.0833	0.00873	-0.118	-0.150	-0.0360	-0.114	0.122	-0.178*	0.0239
	(0.0700)	(0.0565)	(0.0359)	(0.0820)	(0.0525)	(0.0943)	(0.0458)	(0.108)	(0.0997)	(0.0930)	(0.133)	(0.108)	(0.0816)	(0.0541)
N	479	479	479	479	479	479	479	479	479	479	479	479	479	479
chi2	19.00	9.897	18.74	7.490	15.00	16.50	6.356	10.62	23.24	11.78	9.429	4.896	7.655	3.924
rho	0.460	0.223	0.101	-0.0592	0.169	-0.403	0.0423	-0.554	-0.689	-0.176	-0.542	0.552	-0.747	0.0989
lambda	0.0934	0.0461	0.0222	-0.0118	0.0364	-0.0833	0.00873	-0.118	-0.150	-0.0360	-0.114	0.122	-0.178	0.0239

Note: Standard errors in parentheses

+ p<0.1, * p<0.05, ** p<0.01

For the correspondence between the number and the service items, please refer Table 2

For the details of the dummy variables in the selection equation, please see Table 5

Appendix Table 3-4: The Estimation Results of the Sample Selection Models by Heckman for Japan Sample

	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)
							Selection Equation							
2.edu	0.724	-5.275**	-4.778**	-6.880**	-6.513**	-5.659**	-0.379	5.564**	0.140	6.134**	-6.044**	-0.267	-4.608**	4.312**
	(4.734)	(0.583)	(0.583)	(0.468)	(0.431)	(0.618)	(4.262)	(0.401)	(4.619)	(0.481)	(0.350)	(4.264)	(0.693)	(0.797)
3.edu	0.650	-5.323	-3.712	-6.353**	-6.014**	-5.690	-0.329	5.429**	-0.156	5.932**	-5.600	-0.160	-4.350	5.531
	(4.782)	(37.73)	(14.72)	(0.522)	(0.604)	(7.011)	(4.374)	(0.623)	(4.524)	(0.590)	(33.79)	(4.220)	(21.28)	(33.78)
4.edu	0.997	-5.171**	-5.038**	-6.888**	-5.845**	-5.763**	-0.354	4.986**	-0.121	6.026**	-5.987**	-0.253	-4.986**	4.999**
	(4.690)	(0.613)	(0.529)	(0.517)	(0.413)	(0.560)	(4.256)	(0.422)	(4.665)	(0.477)	(0.436)	(4.253)	(0.757)	(0.658)
5.edu	1.160	-5.157**	-5.052**	-6.567**	-6.406**	-5.762**	-0.219	5.394**	-0.0152	5.981**	-5.647**	-0.00689	-4.758**	5.441**
	(4.716)	(0.574)	(0.527)	(0.435)	(0.442)	(0.482)	(4.203)	(0.441)	(4.643)	(0.436)	(0.443)	(4.276)	(0.735)	(0.656)
6.edu	1.070	-5.240**	-4.819**	-6.689**	-6.363**	-5.643**	-0.335	5.290**	0.113	5.697**	-6.011**	-0.363	-4.763**	5.124**
	(4.692)	(0.562)	(0.463)	(0.382)	(0.383)	(0.487)	(4.216)	(0.396)	(4.637)	(0.429)	(0.381)	(4.262)	(0.697)	(0.622)
7.edu	0.684	-5.060**	-4.482**	-6.352**	-5.967**	-5.181**	0.0249	5.198**	0.0584	5.600**	-6.035**	-0.00739	-3.923	5.788**
	(4.732)	(0.584)	(0.511)	(0.408)	(0.484)	(0.514)	(4.258)	(0.395)	(4.641)	(0.458)	(0.383)	(4.275)	(3.976)	(0.663)
obj_siteseeing	0.0452	-0.0688	-0.477*	-0.223+	-0.540**	-0.646**	-0.218	-0.135	-0.319+	-0.0888	-0.0375	-0.355*	0.0794	-0.293
	(0.167)	(0.168)	(0.191)	(0.116)	(0.150)	(0.163)	(0.151)	(0.172)	(0.180)	(0.157)	(0.134)	(0.176)	(0.177)	(0.185)
obj_business 1	0.0801	0.104	0.161	0.336*	0.189	0.157	-0.0587	0.180	-0.0990	0.153	0.106	0.180	-0.433+	0.477**
	(0.213)	(0.203)	(0.192)	(0.154)	(0.161)	(0.212)	(0.208)	(0.173)	(0.231)	(0.197)	(0.193)	(0.201)	(0.248)	(0.168)
obj_business 2	0.116	0.364*	0.308	0.306*	0.283*	0.152	0.340*	0.104	0.0794	0.338*	0.319*	0.431**	0.302	0.0261
	(0.238)	(0.177)	(0.216)	(0.143)	(0.133)	(0.164)	(0.159)	(0.191)	(0.194)	(0.160)	(0.154)	(0.163)	(0.236)	(0.158)
obj_business 3	0.430+	-0.00113	0.0322	0.238	-0.0175	-0.164	0.160	0.290+	0.0175	0.274	-0.146	0.0175	0.237	0.0548
	(0.256)	(0.182)	(0.158)	(0.180)	(0.222)	(0.212)	(0.176)	(0.161)	(0.174)	(0.175)	(0.191)	(0.181)	(0.238)	(0.213)
obj_student	0.386	0.406+	0.790**	0.289+	0.187	0.508*	-0.00661	-0.136	0.182	-0.0594	-0.0765	0.229	0.550+	0.904**
	(0.238)	(0.241)	(0.292)	(0.158)	(0.221)	(0.218)	(0.186)	(0.211)	(0.215)	(0.215)	(0.171)	(0.221)	(0.325)	(0.226)
obj_voluntary	-0.300	-0.115	-0.345	-0.00790	-0.212	-0.572	0.217	-0.124	0.198	0.351	0.210	-0.208	-0.540	-0.0474
	(0.462)	(0.313)	(0.479)	(0.340)	(0.305)	(0.459)	(0.374)	(0.343)	(0.340)	(0.310)	(0.302)	(0.341)	(0.425)	(0.473)
obj_visiting friends	0.103	-0.0732	0.108	0.0314	-0.0116	-0.00237	-0.107	-0.0435	0.165	0.171	0.342	-0.107	0.250	0.364
	(0.297)	(0.197)	(0.243)	(0.226)	(0.206)	(0.323)	(0.190)	(0.233)	(0.155)	(0.173)	(0.239)	(0.211)	(0.259)	(0.235)
obj_accampanying fam	0.0162	0.350+	0.112	0.402+	0.427+	0.510+	0.398+	0.286	0.129	0.0865	0.0142	0.881**	0.0679	0.189
	(0.275)	(0.186)	(0.265)	(0.208)	(0.223)	(0.307)	(0.205)	(0.198)	(0.181)	(0.219)	(0.174)	(0.237)	(0.296)	(0.284)
obj_others	-0.282	0.483	10.52	0.621+	0.861*	18.40+	0.761*	0.592*	1.436	0.336	0.206	-0.0571	0.435	-0.128
	(0.398)	(6.101)	(9.896)	(0.318)	(0.405)	(9.482)	(0.372)	(0.262)	(4.535)	(0.351)	(0.328)	(0.362)	(7.658)	(0.519)
nominal exchange rate	-0.00198	0.00995	-0.00104	0.00545	-0.000792	0.00184	0.00468	-0.00254	0.00247	0.000280	0.0112+	0.000735	0.0134+	-0.000162
	(0.00747)	(0.00605)	(0.00661)	(0.00570)	(0.00581)	(0.00533)	(0.00572)	(0.00704)	(0.00626)	(0.00455)	(0.00584)	(0.00632)	(0.00697)	(0.00634)
1.jobclass	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
2.jobclass	-0.0520	-0.600+	-0.950*	-0.521	-0.176	-0.210	-0.415	0.212	-0.938	-0.505	-0.0193	-0.0772	-0.153	-0.292
	(3.247)	(0.362)	(0.427)	(0.350)	(0.399)	(1.238)	(0.358)	(0.284)	(2.199)	(0.441)	(0.316)	(0.267)	(0.453)	(0.499)
3.jobclass	-0.414	0.00191	-0.491	0.107	-0.0704	-0.718*	-0.00969	0.409	-0.163	0.0312	-0.192	-0.361	-0.543	0.412
	(0.355)	(0.393)	(0.394)	(0.356)	(0.403)	(0.355)	(0.435)	(0.335)	(0.427)	(0.407)	(0.423)	(1.071)	(0.445)	(0.369)
4.jobclass	-0.427	-0.0198	-0.140	-0.0538	0.139	-0.281	-0.0705	0.0988	-0.387+	0.122	0.175	0.185	0.0575	-0.163
	(0.321)	(0.217)	(0.249)	(0.236)	(0.276)	(0.229)	(0.248)	(0.240)	(0.219)	(0.224)	(0.214)	(0.233)	(0.274)	(0.293)
5.jobclass	-0.344	0.177	0.0920	0.223	0.0664	-0.0946	-0.128	-0.168	-0.213	-0.261	-0.0194	0.148	0.211	-0.403
	(0.256)	(0.199)	(0.238)	(0.197)	(0.177)	(0.225)	(0.246)	(0.210)	(0.170)	(0.223)	(0.239)	(0.200)	(0.315)	(0.346)
constant	-1.796	2.734*	2.991+	2.924*	2.977**	5.322**	-1.981	-8.508**	-3.349	-7.357**	2.016	-2.255	1.503	-6.180**
	(4.817)	(1.138)	(1.814)	(1.375)	(1.118)	(1.747)	(4.212)	(1.296)	(4.934)	(1.327)	(1.386)	(4.682)	(1.829)	(1.412)
mills ratio	0.0562	0.0495	-0.0118	-0.00656	0.0712	-0.00405	-0.0107	-0.0290	-0.0180	0.0211	-0.0268	0.0658	0.177*	0.0803
	(0.0651)	(0.0723)	(0.0491)	(0.0515)	(0.0567)	(0.0547)	(0.0690)	(0.0536)	(0.0764)	(0.0893)	(0.0702)	(0.0471)	(0.0820)	(0.0611)
N	479	479	479	479	479	479	479	479	479	479	479	479	479	479
chi2	2.024	13.17	10.15	14.12	1.384	4.312	29.75	9.749	5.844	7.417	9.770	7.130	4.572	8.721
rho	0.274	0.237	-0.0605	-0.0328	0.263	-0.0202	-0.0545	-0.146	-0.0846	0.100	-0.145	0.304	0.670	0.266
lambda	0.0562	0.0495	-0.0118	-0.00656	0.0712	-0.00405	-0.0107	-0.0290	-0.0180	0.0211	-0.0268	0.0658	0.177	0.0803

Note: Standard errors in parentheses

+ p<0.1, * p<0.05, ** p<0.01

For the correspondence between the number and the service items, please refer Table 2

For the details of the dummy variables in the selection equation, please see Table 5

Appendix Table 4-1: The Estimation Results of the Sample Selection Modesl by Heckman for the US Sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Main Equation														
Female	0.0578	-0.0375	0.0214	0.0755+	-0.0351	-0.0211	0.0459	-0.0594	-0.0258	0.00904	-0.0497	-0.0951+	-0.0159	-0.0425
	(0.0508)	(0.0492)	(0.0927)	(0.0453)	(0.0525)	(0.0362)	(0.0571)	(0.0414)	(0.0401)	(0.0444)	(0.0411)	(0.0496)	(0.0399)	(0.0573)
Married	-0.0855	-0.0778	-0.161	-0.0372	-0.0981	-0.0666	-0.0179	-0.0630	-0.0554	-0.0238	-0.0622	-0.0386	-0.0797+	-0.0946
	(0.0616)	(0.0778)	(0.108)	(0.0654)	(0.0851)	(0.0549)	(0.0747)	(0.0558)	(0.0640)	(0.0563)	(0.0537)	(0.0566)	(0.0452)	(0.0745)
age	0.0133	0.00837	0.00308	0.0106	0.00184	0.0133	0.0358	0.00639	0.00647	0.0199	0.0122	0.0178	0.00790	-0.0106
	(0.0113)	(0.0169)	(0.0276)	(0.0147)	(0.0162)	(0.0137)	(0.0261)	(0.0120)	(0.0140)	(0.0123)	(0.0120)	(0.0152)	(0.0138)	(0.0144)
age squared	-0.000163	-0.000114	0.0000176	-0.000110	-0.0000450	-0.000209	-0.000459	-0.000119	-0.000117	-0.000271+	-0.000207	-0.000262	-0.000149	0.0000599
	(0.000132)	(0.000212)	(0.000394)	(0.000179)	(0.000188)	(0.000167)	(0.000344)	(0.000147)	(0.000171)	(0.000151)	(0.000145)	(0.000191)	(0.000167)	(0.000177)
ln (family size)	0.000181	0.00762	0.0586	-0.0441	-0.0330	-0.0310	-0.00443	-0.0242	-0.0116	-0.0301	-0.0223	-0.00498	-0.00238	-0.0212
	(0.0468)	(0.0681)	(0.0895)	(0.0565)	(0.0662)	(0.0475)	(0.0563)	(0.0588)	(0.0470)	(0.0475)	(0.0450)	(0.0472)	(0.0516)	(0.0741)
univeristy graduate	0.0611	0.0283	0.00862	0.0124	-0.0138	0.0121	0.00611	-0.0338	-0.0269	-0.00284	0.0151	-0.0352	0.00720	0.0508
	(0.0515)	(0.0588)	(0.0785)	(0.0528)	(0.0652)	(0.0347)	(0.0521)	(0.0380)	(0.0481)	(0.0419)	(0.0445)	(0.0559)	(0.0398)	(0.0489)
ln (household income)	0.0335	0.0443	-0.0843	-0.0195	0.0818*	0.0476+	-0.0115	0.0412	0.0219	0.0278	0.0431	0.0586	0.0282	0.0499
	(0.0343)	(0.0330)	(0.0530)	(0.0346)	(0.0359)	(0.0272)	(0.0350)	(0.0298)	(0.0265)	(0.0281)	(0.0262)	(0.0410)	(0.0301)	(0.0372)
constant	0.388	0.572	2.126*	1.237**	0.272	0.389	0.611	0.661+	0.807+	0.397	0.508	0.265	0.706*	0.768+
	(0.431)	(0.465)	(0.897)	(0.387)	(0.432)	(0.352)	(0.579)	(0.366)	(0.456)	(0.348)	(0.372)	(0.516)	(0.318)	(0.413)
Selection Equation														
fluency in Japanese	-0.0584	0.169	0.199	0.113	0.205	0.0352	0.321*	-0.181	0.0614	0.0526	-0.0131	0.117	-0.246	0.0983
	(0.206)	(0.147)	(0.180)	(0.186)	(0.182)	(0.154)	(0.139)	(0.166)	(0.180)	(0.201)	(0.158)	(0.120)	(0.198)	(0.192)
Female	0.0396	0.207	0.0416	-0.150	-0.147	0.0423	0.125	0.155	0.125	0.250	0.156	0.297*	-0.0926	-0.0249
	(0.196)	(0.174)	(0.165)	(0.173)	(0.159)	(0.145)	(0.143)	(0.154)	(0.175)	(0.152)	(0.170)	(0.145)	(0.161)	(0.187)
married	0.247	0.0466	0.0450	0.0511	0.0204	0.0370	-0.0945	0.157	0.0589	0.139	0.273	0.166	0.0111	-0.0609
	(0.229)	(0.171)	(0.187)	(0.202)	(0.221)	(0.211)	(0.209)	(0.200)	(0.196)	(0.192)	(0.234)	(0.215)	(0.201)	(0.202)
age	0.0677	0.00647	0.0660	-0.00894	-0.0246	-0.0147	0.0700	-0.00683	0.0207	-0.0575	0.0347	-0.0228	-0.102	-0.0594
	(0.0489)	(0.0524)	(0.0662)	(0.0484)	(0.0502)	(0.0498)	(0.0480)	(0.0391)	(0.0480)	(0.0977)	(0.0549)	(0.0561)	(0.0666)	(0.0491)
age squared	-0.000816	-0.000128	-0.00106	0.0000816	0.000365	0.000339	-0.000906	0.000305	-0.000138	0.000880	-0.000109	0.000267	0.00159+	0.000751
	(0.000594)	(0.000659)	(0.000913)	(0.000614)	(0.000615)	(0.000634)	(0.000570)	(0.000505)	(0.000618)	(0.00132)	(0.000641)	(0.000715)	(0.000870)	(0.000587)
ln (household income)	0.0621	-0.0163	0.252*	-0.110	0.167+	0.0596	0.176	0.0654	0.111	0.0544	-0.0813	0.0142	0.0595	0.222+
	(0.146)	(0.150)	(0.120)	(0.112)	(0.101)	(0.116)	(0.110)	(0.121)	(0.128)	(0.130)	(0.139)	(0.131)	(0.137)	(0.123)
lnfamsize	0.0635	0.105	0.0123	0.0663	-0.0545	-0.0950	-0.0692	0.0528	0.00685	0.0579	0.174	0.0497	-0.00719	0.00413
	(0.168)	(0.157)	(0.180)	(0.155)	(0.179)	(0.184)	(0.151)	(0.169)	(0.177)	(0.140)	(0.162)	(0.144)	(0.183)	(0.129)

Appendix Table 4-2: The Estimation Results of the Sample Selection Modesl by Heckman for the US Sample

	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)
Main Equation														
Female	0.0281	-0.0528	0.0141	-0.149+	-0.0400	-0.0159	0.00633	-0.0722	-0.0567	-0.0557	-0.0262	0.0276	-0.0177	-0.00481
	(0.0467)	(0.0613)	(0.0478)	(0.0873)	(0.0772)	(0.0714)	(0.0557)	(0.0446)	(0.0703)	(0.0646)	(0.0401)	(0.0486)	(0.0434)	(0.0780)
Married	-0.108	-0.154	-0.0834	-0.00699	-0.0761	-0.178+	-0.0713	-0.0898	-0.106	-0.0463	-0.0824	-0.0704	-0.0651	-0.158
	(0.0794)	(0.0971)	(0.0642)	(0.0916)	(0.111)	(0.103)	(0.0833)	(0.0632)	(0.0962)	(0.0702)	(0.0782)	(0.0776)	(0.0637)	(0.102)
age	-0.00249	0.000906	-0.0130	0.0375	0.0290	0.00631	0.0237	0.0101	0.000750	0.0285+	-0.00181	0.0234	0.0136	-0.0354
	(0.0179)	(0.0192)	(0.0165)	(0.0351)	(0.0284)	(0.0250)	(0.0176)	(0.0152)	(0.0259)	(0.0169)	(0.0198)	(0.0227)	(0.0141)	(0.0308)
age squared	-0.0000307	-0.0000212	0.000105	-0.000603	-0.000408	-0.000156	-0.000357+	-0.000213	-0.0000164	-0.000456*	-0.0000256	-0.000336	-0.000220	0.000428
	(0.000217)	(0.000237)	(0.000200)	(0.000477)	(0.000365)	(0.000324)	(0.000210)	(0.000191)	(0.000342)	(0.000216)	(0.000255)	(0.000328)	(0.000167)	(0.000411)
ln (family size)	-0.0292	-0.0509	-0.0280	0.0476	-0.0828	-0.0776	0.0281	-0.0133	-0.0678	-0.0651	-0.0562	-0.0501	-0.0615	-0.0353
	(0.0667)	(0.0613)	(0.0539)	(0.0707)	(0.0667)	(0.0957)	(0.0655)	(0.0498)	(0.0781)	(0.0671)	(0.0611)	(0.0773)	(0.0443)	(0.0907)
univeristy graduate	0.0246	0.00428	-0.0510	0.0241	-0.0589	-0.0141	0.0916+	-0.00379	-0.0440	-0.0750	-0.0193	0.0146	0.0267	0.0301
	(0.0443)	(0.0554)	(0.0472)	(0.0819)	(0.0620)	(0.0650)	(0.0540)	(0.0478)	(0.0726)	(0.0626)	(0.0408)	(0.0627)	(0.0442)	(0.0828)
ln (household income)	0.0292	0.0377	0.0356	0.0795	0.0536	0.0858+	0.0378	0.0667*	0.0102	0.102**	0.0417	0.0300	0.0249	0.0719
	(0.0381)	(0.0433)	(0.0321)	(0.0547)	(0.0432)	(0.0466)	(0.0354)	(0.0339)	(0.0496)	(0.0353)	(0.0342)	(0.0392)	(0.0362)	(0.0465)
constant	0.995*	0.959+	1.185**	-0.390	0.257	0.260	0.161	0.270	1.233+	-0.486	0.920*	0.456	0.735+	0.865
	(0.414)	(0.507)	(0.324)	(0.854)	(0.723)	(0.584)	(0.545)	(0.404)	(0.672)	(0.417)	(0.390)	(0.540)	(0.426)	(0.632)
Selection Equation														
fluency in Japanese	0.00538	-0.0139	0.122	0.308	0.298	0.376*	0.0933	0.105	0.324+	0.0701	-0.102	0.267	-0.0292	-0.0965
	(0.163)	(0.148)	(0.155)	(0.192)	(0.196)	(0.161)	(0.176)	(0.167)	(0.193)	(0.144)	(0.149)	(0.182)	(0.144)	(0.134)
Female	0.0652	0.413**	-0.0274	0.299+	0.184	0.106	0.0981	-0.142	0.381**	0.263+	-0.0466	-0.0675	0.0834	0.483*
	(0.177)	(0.135)	(0.147)	(0.165)	(0.168)	(0.168)	(0.155)	(0.174)	(0.137)	(0.156)	(0.150)	(0.170)	(0.132)	(0.206)
married	0.191	0.265	0.345	0.116	0.0194	-0.0785	0.0931	0.180	-0.0620	0.102	-0.0289	0.00226	0.205	-0.355+
	(0.194)	(0.230)	(0.211)	(0.245)	(0.227)	(0.231)	(0.209)	(0.194)	(0.209)	(0.204)	(0.199)	(0.204)	(0.219)	(0.196)
age	0.107*	0.0261	0.0382	-0.0116	0.0309	-0.0209	-0.0425	0.00334	0.119*	0.0434	0.0551	0.0489	0.0551	0.0471
	(0.0500)	(0.0508)	(0.0390)	(0.0691)	(0.0768)	(0.0530)	(0.0561)	(0.0423)	(0.0532)	(0.0484)	(0.0644)	(0.0773)	(0.0501)	(0.0631)
age squared	-0.00121+	-0.000545	-0.000422	-0.0000490	-0.000534	0.000267	0.000646	-0.0000399	-0.00161*	-0.000632	-0.000719	-0.000999	-0.000537	-0.00102
	(0.000628)	(0.000681)	(0.000489)	(0.000897)	(0.00107)	(0.000669)	(0.000698)	(0.000547)	(0.000676)	(0.000614)	(0.000819)	(0.00106)	(0.000614)	(0.000894)
ln (household income)	0.0571	0.0318	0.169	-0.00262	-0.0658	0.0191	0.0707	0.116	0.0415	0.0417	-0.0722	-0.0462	0.231*	-0.00339
	(0.120)	(0.113)	(0.109)	(0.148)	(0.144)	(0.126)	(0.107)	(0.111)	(0.109)	(0.115)	(0.118)	(0.122)	(0.110)	(0.124)
lnfamsize	-0.119	0.133	-0.0951	-0.0536	-0.200	-0.0540	0.0234	-0.0731	-0.0452	-0.152	-0.119	-0.0914	0.137	-0.257
	(0.183)	(0.156)	(0.170)	(0.234)	(0.165)	(0.182)	(0.163)	(0.158)	(0.155)	(0.131)	(0.170)	(0.195)	(0.165)	(0.158)

Appendix Table 4-3: The Estimation Results of the Sample Selection Modesl by Heckman for the US Sample														
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
							Selection Equation							
2.edu	-0.837	0.103	-1.030	0.0145	0.548	0.661	-0.0812	0.373	0.594	1.064	0.830	0.390	0.302	-1.237
	(2.656)	(0.525)	(1.502)	(1.084)	(2.734)	(1.977)	(1.314)	(2.009)	(1.582)	(2.702)	(2.708)	(1.814)	(1.847)	(2.405)
3.edu	0.0257	0.0838	-1.372	-0.0726	0.293	1.020	-0.120	0.381	0.882	1.471	1.560	0.193	0.648	-1.811
	(2.657)	(0.495)	(1.404)	(1.096)	(2.711)	(1.963)	(1.441)	(2.088)	(1.646)	(2.728)	(2.639)	(1.846)	(1.826)	(2.346)
4.edu	-0.397	0.246	-1.267	-0.201	0.548	0.692	-0.112	0.329	0.492	0.766	0.578	0.149	0.931	-1.073
	(2.619)	(0.577)	(1.771)	(1.139)	(2.654)	(1.957)	(1.374)	(2.097)	(1.714)	(2.618)	(2.759)	(1.891)	(1.859)	(2.431)
5.edu	-0.350	0.0988	-1.290	0.0841	0.378	0.784	0.177	0.850	0.904	1.304	1.505	0.632	0.881	-1.462
	(2.666)	(0.499)	(1.509)	(1.101)	(2.730)	(1.999)	(1.354)	(2.049)	(1.641)	(2.699)	(2.754)	(1.812)	(1.844)	(2.397)
6.edu	-0.574	0.0747	-1.453	0.385	0.543	1.070	-0.241	0.684	0.829	1.370	1.359	0.679	0.835	-1.167
	(2.691)	(0.516)	(1.496)	(1.043)	(2.739)	(1.992)	(1.339)	(2.034)	(1.661)	(2.678)	(2.773)	(1.836)	(1.841)	(2.406)
7.edu	-0.482	-0.229	-1.602	0.243	0.562	0.937	-0.166	0.131	0.515	0.887	1.243	0.642	0.631	-1.227
	(2.622)	(0.555)	(1.505)	(1.054)	(2.748)	(2.041)	(1.303)	(2.062)	(1.653)	(2.672)	(2.762)	(1.859)	(1.797)	(2.404)
obj_siteseeing	0.426*	0.669**	0.0629	0.524**	0.805**	0.675**	0.0174	0.552**	0.711**	0.396*	0.418**	0.270	0.555**	0.508**
	(0.176)	(0.145)	(0.161)	(0.168)	(0.181)	(0.153)	(0.169)	(0.145)	(0.136)	(0.159)	(0.151)	(0.172)	(0.186)	(0.149)
obj_business 1	0.308	0.413*	0.257	0.271	0.0913	0.247	0.447*	0.156	0.0443	0.0550	-0.0902	-0.162	0.0866	0.295+
	(0.207)	(0.167)	(0.192)	(0.188)	(0.184)	(0.218)	(0.188)	(0.215)	(0.180)	(0.212)	(0.197)	(0.149)	(0.183)	(0.162)
obj_business 2	-0.0301	-0.0885	-0.0928	-0.0806	0.0415	-0.101	0.194	0.0342	0.0289	-0.0911	-0.313	0.0249	-0.172	-0.0592
	(0.272)	(0.294)	(0.268)	(0.252)	(0.245)	(0.264)	(0.230)	(0.270)	(0.255)	(0.305)	(0.249)	(0.245)	(0.299)	(0.266)
obj_business 3	0.339+	0.274	0.432*	0.280+	0.377*	0.352+	0.123	0.423*	0.453*	0.382*	0.426*	0.171	0.200	0.400*
	(0.182)	(0.175)	(0.178)	(0.152)	(0.170)	(0.186)	(0.210)	(0.195)	(0.182)	(0.163)	(0.186)	(0.178)	(0.192)	(0.158)
obj_student	-0.134	-0.0651	-0.148	-0.132	0.0569	0.290	-0.229	-0.185	-0.209	-0.248	-0.0425	0.109	-0.166	0.101
	(0.263)	(0.306)	(0.283)	(0.283)	(0.217)	(0.242)	(0.287)	(0.227)	(0.245)	(0.222)	(0.239)	(0.219)	(0.281)	(0.231)
obj_voluntary	-0.173	0.181	0.569**	0.266	0.384+	0.0232	0.336	-0.0774	-0.665**	-0.351+	-0.0453	-0.112	-0.142	-0.443+
	(0.251)	(0.175)	(0.187)	(0.233)	(0.225)	(0.268)	(0.219)	(0.196)	(0.234)	(0.196)	(0.206)	(0.191)	(0.195)	(0.242)
obj_visiting friends	-0.0394	0.142	0.333	0.0752	0.242	-0.0745	0.261	0.00659	0.272	0.000147	0.161	-0.113	-0.0660	0.246
	(0.196)	(0.153)	(0.237)	(0.153)	(0.169)	(0.188)	(0.164)	(0.155)	(0.165)	(0.143)	(0.155)	(0.173)	(0.170)	(0.217)
obj_accampanying family	0.310	0.897	0.679	0.397	0.524	-0.281	0.0377	0.419	0.488	1.338	0.721	0.588	0.740*	0.319
	(11.40)	(1.040)	(0.444)	(1.011)	(0.380)	(0.385)	(0.424)	(0.344)	(0.423)	(12.24)	(5.200)	(0.929)	(0.352)	(0.405)
obj_others	-0.155	0.434	0.176	-0.646	0.284	-0.477	0.175	0.186	0.360	-0.292	0.116	-0.532	0.430	-0.200
	(0.590)	(0.972)	(2.005)	(1.948)	(0.667)	(0.498)	(0.509)	(0.496)	(1.033)	(0.488)	(0.534)	(12.65)	(1.308)	(0.487)
nominal exchange rate	-0.00127	0.00468	0.00693	0.00718	0.000634	0.00764	-0.000197	0.00907+	0.00196	0.00963+	0.00634	0.00660	0.00453	-0.00563
	(0.00492)	(0.00519)	(0.00618)	(0.00483)	(0.00506)	(0.00520)	(0.00494)	(0.00544)	(0.00509)	(0.00511)	(0.00493)	(0.00523)	(0.00599)	(0.00584)
1.jobclass	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
2.jobclass	-0.226	0.194	0.898+	-0.164	0.383	-0.550	0.456	0.292	-0.0492	-0.00979	-0.185	-0.156	0.0702	-0.262
	(0.446)	(0.372)	(0.528)	(0.483)	(1.159)	(0.384)	(0.403)	(0.554)	(0.459)	(1.033)	(0.335)	(0.401)	(0.549)	(0.513)
3.jobclass	-0.325	-0.231	-0.0793	0.227	0.383	-0.102	0.169	0.405	0.335	0.246	0.242	0.0970	0.410	-0.378
	(0.296)	(0.282)	(0.354)	(0.297)	(0.282)	(0.355)	(0.265)	(0.280)	(0.272)	(0.304)	(0.296)	(0.277)	(0.296)	(0.266)
4.jobclass	-0.534	0.236	-5.803	-0.716	0.452	-1.198	-6.145	-0.191	-0.250	-0.283	-1.232	-6.161	-6.886	-0.449
	(49.59)	(2.957)	(19.18)	(3.538)	(40.91)	(20.66)	(46.24)	(3.168)	(3.224)	(12.98)	(76.48)	(68.92)	(48.01)	(35.60)
5.jobclass	0.187	-0.152	0.146	0.0820	-0.0250	0.198	0.244	-0.0239	-0.0191	0.0240	-0.188	0.100	0.146	-0.0878
	(0.252)	(0.190)	(0.269)	(0.223)	(0.270)	(0.216)	(0.211)	(0.202)	(0.284)	(0.172)	(0.220)	(0.222)	(0.285)	(0.242)
constant	-1.156	-1.366	-4.570*	-0.0756	-3.290	-2.280	-3.745+	-2.745	-3.134	-2.271	-2.351	-1.381	-0.246	-0.114
	(2.906)	(1.783)	(2.257)	(1.856)	(2.983)	(2.433)	(1.985)	(2.501)	(2.343)	(2.774)	(2.645)	(2.439)	(2.256)	(3.010)
mills ratio	-0.0772	-0.189+	-0.226*	-0.172+	-0.0574	0.0143	-0.0932	-0.0207	0.00172	0.0935	0.0101	-0.0645	0.0106	0.144+
	(0.136)	(0.100)	(0.106)	(0.104)	(0.0806)	(0.0835)	(0.129)	(0.0993)	(0.0917)	(0.0936)	(0.0726)	(0.135)	(0.0768)	(0.0852)
N	404	404	404	404	404	404	404	404	404	404	404	404	404	404
chi2	12.54	8.303	8.808	7.233	9.444	14.40	3.035	12.05	4.941	4.960	12.88	11.33	10.42	16.15
rho	-0.207	-0.528	-0.618	-0.517	-0.186	0.0490	-0.280	-0.0714	0.00585	0.303	0.0323	-0.199	0.0341	0.424
lambda	-0.0772	-0.189	-0.226	-0.172	-0.0574	0.0143	-0.0932	-0.0207	0.00172	0.0935	0.0101	-0.0645	0.0106	0.144

Note: Standard errors in parentheses es

+ p<0.1, * p<0.05, ** p<0.01

For the correspondence between the number and the service items, please refer Table 2

For the details of the dummy variables in the selection equation, please see Table 5

Appendix Table 4-4: The Estimation Results of the Sample Selection Modesl by Heckman for the US Sample

	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)
Selection Equation														
2.edu	-1.255	-0.385	0.550	-0.0409	0.684	0.347	0.590	0.917	-0.0533	0.506	1.190	0.276	0.143	-0.144
	(2.416)	(1.847)	(2.192)	(2.162)	(2.511)	(2.025)	(2.611)	(2.577)	(2.372)	(2.186)	(2.906)	(2.134)	(2.206)	(2.068)
3.edu	-0.768	-0.718	0.357	-0.610	0.266	-0.276	0.486	0.908	-0.332	0.199	0.485	0.125	0.170	0.0622
	(2.433)	(1.849)	(2.287)	(2.037)	(2.682)	(2.093)	(2.705)	(2.609)	(2.350)	(2.244)	(2.926)	(2.177)	(2.185)	(2.114)
4.edu	-0.887	-0.862	0.0120	-0.528	0.171	-0.0830	0.878	1.298	-0.431	0.334	0.718	0.235	0.376	0.118
	(2.381)	(1.843)	(2.324)	(2.167)	(2.687)	(2.080)	(2.641)	(2.625)	(2.330)	(2.223)	(2.952)	(2.090)	(2.261)	(2.102)
5.edu	-0.936	-0.814	0.277	-0.392	0.704	0.325	0.590	1.160	-0.0108	0.443	0.750	0.193	0.601	-0.0324
	(2.385)	(1.833)	(2.197)	(2.044)	(2.516)	(2.071)	(2.604)	(2.627)	(2.406)	(2.315)	(2.873)	(2.123)	(2.215)	(2.145)
6.edu	-0.923	-0.797	0.604	-0.383	0.485	0.254	0.696	1.007	0.262	0.442	1.084	0.326	0.633	-0.380
	(2.390)	(1.833)	(2.227)	(2.128)	(2.537)	(2.034)	(2.637)	(2.601)	(2.410)	(2.227)	(2.890)	(2.154)	(2.176)	(2.088)
7.edu	-0.997	-0.657	0.266	-0.683	0.323	0.221	0.531	0.668	0.312	0.0906	0.946	0.306	0.148	-0.480
	(2.398)	(1.823)	(2.229)	(2.164)	(2.566)	(2.009)	(2.655)	(2.619)	(2.339)	(2.278)	(2.869)	(2.155)	(2.184)	(2.174)
obj_siteseeing	0.505**	0.149	0.429**	0.206	0.0106	0.172	0.113	0.457**	-0.125	0.282+	0.290+	0.177	0.471**	0.0803
	(0.161)	(0.172)	(0.160)	(0.163)	(0.199)	(0.163)	(0.162)	(0.163)	(0.164)	(0.153)	(0.173)	(0.167)	(0.116)	(0.213)
obj_business 1	0.551**	0.161	0.292+	0.356+	0.233	0.144	0.206	-0.0000793	0.0724	0.0856	0.228	0.443*	0.388+	0.178
	(0.173)	(0.184)	(0.168)	(0.183)	(0.216)	(0.181)	(0.175)	(0.201)	(0.144)	(0.205)	(0.171)	(0.196)	(0.214)	(0.232)
obj_business 2	-0.309	0.185	0.0446	0.537*	0.839**	0.372	0.188	0.101	0.216	-0.187	0.0000925	0.0858	-0.309	0.381
	(0.222)	(0.202)	(0.274)	(0.271)	(0.257)	(0.239)	(0.266)	(0.239)	(0.258)	(0.263)	(0.224)	(0.218)	(0.301)	(0.301)
obj_business 3	0.408**	0.376*	0.276	0.483**	0.334+	0.261	0.424*	0.425*	0.260	0.248	0.278+	0.0826	0.0821	0.407*
	(0.149)	(0.167)	(0.186)	(0.172)	(0.185)	(0.190)	(0.201)	(0.169)	(0.190)	(0.167)	(0.152)	(0.179)	(0.166)	(0.186)
obj_student	0.375	0.221	-0.0829	-0.0757	-0.562+	0.155	0.0417	0.285	0.373	0.139	-0.405+	-0.343	-0.0548	0.410
	(0.253)	(0.254)	(0.285)	(0.359)	(0.287)	(0.262)	(0.249)	(0.219)	(0.231)	(0.187)	(0.223)	(0.232)	(0.278)	(0.293)
obj_voluntary	-0.00641	0.293	0.110	0.431*	0.571**	-0.0946	-0.135	-0.235	0.279	-0.338	0.142	0.451+	0.252	0.314
	(0.218)	(0.196)	(0.216)	(0.212)	(0.203)	(0.251)	(0.237)	(0.245)	(0.228)	(0.229)	(0.214)	(0.237)	(0.223)	(0.240)
obj_visiting friends	-0.0120	-0.0946	0.420**	0.177	0.0692	0.117	0.146	-0.0114	0.127	-0.0105	0.237	0.282+	0.0453	-0.171
	(0.191)	(0.170)	(0.141)	(0.181)	(0.204)	(0.152)	(0.198)	(0.181)	(0.181)	(0.163)	(0.170)	(0.168)	(0.154)	(0.217)
obj_accampanying family	-0.0321	0.0813	0.150	0.677+	0.650+	0.165	0.461	0.433	0.323	0.446	0.193	0.475	0.424	0.972**
	(0.420)	(0.351)	(2.640)	(0.382)	(0.340)	(0.370)	(0.422)	(0.321)	(0.298)	(0.360)	(0.332)	(0.351)	(0.340)	(0.352)
obj_others	-0.141	0.0859	0.167	-0.871	0.426	-0.325	-0.101	0.226	-0.317	-0.0769	1.210	-0.288	0.283	-0.270
	(0.493)	(6.115)	(1.263)	(10.99)	(1.016)	(0.952)	(0.997)	(0.389)	(0.997)	(0.473)	(13.12)	(2.373)	(13.39)	(1.882)
nominal exchange rate	0.00251	0.00282	0.00770	0.0000557	-0.00494	-0.00201	-0.0112*	0.00401	0.00516	0.00488	0.0120*	0.00334	0.00126	-0.00334
	(0.00612)	(0.00485)	(0.00497)	(0.00701)	(0.00647)	(0.00526)	(0.00462)	(0.00373)	(0.00731)	(0.00626)	(0.00575)	(0.00567)	(0.00508)	(0.00645)
1.jobclass	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
2.jobclass	-0.314	0.113	-0.131	0.416	0.231	-0.0713	-0.747	-0.188	0.0609	-0.0294	-0.0588	0.0739	-0.322	-0.429
	(7.512)	(0.415)	(0.458)	(0.536)	(1.132)	(9.903)	(4.662)	(0.407)	(0.403)	(0.392)	(0.457)	(1.619)	(0.454)	(1.279)
3.jobclass	-0.0663	-0.259	0.116	-0.190	-0.211	-0.0666	-0.0561	0.184	-0.139	-0.149	0.139	0.186	0.188	-0.409
	(0.285)	(0.205)	(0.286)	(0.357)	(0.285)	(0.233)	(0.290)	(0.224)	(0.275)	(0.261)	(0.273)	(0.252)	(0.263)	(0.325)
4.jobclass	-6.071	0.999	-1.077	0.699	-5.853	0.665	-0.0923	0.102	-6.109	-0.458	-0.769	0.409	-0.0424	0.504
	(36.93)	(3.630)	(16.23)	(10.99)	(69.75)	(18.68)	(3.432)	(68.33)	(33.03)	(17.20)	(38.15)	(3.127)	(50.86)	(9.565)
5.jobclass	0.123	0.0717	0.0286	-0.154	-0.0236	0.307	0.317	-0.0712	-0.111	0.0236	-0.00727	0.182	0.0654	-0.113
	(0.191)	(0.201)	(0.163)	(0.273)	(0.270)	(0.217)	(0.261)	(0.162)	(0.208)	(0.226)	(0.212)	(0.237)	(0.212)	(0.253)
constant	-2.680	-1.248	-4.363+	-0.821	-0.727	-0.709	-0.418	-3.194	-3.953	-2.318	-2.547	-1.293	-4.978+	-0.559
	(2.565)	(2.643)	(2.338)	(2.555)	(2.507)	(2.586)	(2.589)	(3.052)	(2.780)	(2.605)	(3.360)	(2.690)	(2.885)	(2.537)
mills ratio	-0.0953	-0.201+	-0.168*	0.0694	-0.101	-0.0280	0.0878	0.0524	-0.121	0.224+	-0.113	-0.0336	-0.0255	0.191+
	(0.105)	(0.120)	(0.0729)	(0.104)	(0.0770)	(0.121)	(0.0995)	(0.0846)	(0.108)	(0.119)	(0.0915)	(0.0959)	(0.0823)	(0.0992)
N	404	404	404	404	404	404	404	404	404	404	404	404	404	404
chi2	7.572	9.734	6.668	9.896	6.129	11.61	22.50	13.33	2.369	22.07	4.079	8.559	9.811	12.40
rho	-0.299	-0.593	-0.548	0.207	-0.313	-0.0764	0.263	0.172	-0.344	0.639	-0.369	-0.106	-0.0872	0.513
lambda	-0.0953	-0.201	-0.168	0.0694	-0.101	-0.0280	0.0878	0.0524	-0.121	0.224	-0.113	-0.0336	-0.0255	0.191

Note: Standard errors in parentheses

+ p<0.1, * p<0.05, ** p<0.01

For the correspondence between the number and the service items, please refer Table 2

For the details of the dummy variables in the selection equation, please see Table 5

Appendix Table 5: Descriptive Statistics of the Exclusion Variables

		US Sample			Japan Sample		
		mean	p50	sd	mean	p50	sd
Exchange Rate		99.90	100	14.54	102.92	100	11.99
Fluency in English		0.92	1	0.27	0.70	1	0.46
Fluency in Japanese		0.39	0	0.49	0.96	1	0.20
Objetives of Staying	Sightseeing	0.63	1	0.48	0.47	0	0.50
	Work 1(working in Japan)	0.25	0	0.43	0.18	0	0.39
	Work 2 (stationed in Japan)	0.14	0	0.35	0.30	0	0.46
	Work 3 (business trip)	0.34	0	0.47	0.27	0	0.45
	Study-abroad (including homestay)	0.13	0	0.34	0.25	0	0.43
	Volunteer activities	0.16	0	0.37	0.05	0	0.23
	Visiting family/friends	0.30	0	0.46	0.16	0	0.37
	As a dependent (accompanied family to Japan)	0.05	0	0.22	0.20	0	0.40
	Others	0.03	0	0.16	0.04	0	0.20
Job Class	Company or Public Employees	0.71	1	0.45	0.54	1	0.50
	Professionals	0.03	0	0.18	0.04	0	0.20
	Students	0.10	0	0.31	0.05	0	0.23
	no job	0.01	0	0.10	0.22	0	0.41
	Others including Self employed	0.14	0	0.35	0.15	0	0.36
Educational Background	Junior High School	0.02	0	0.13	0.00	0	0.06
	High School	0.17	0	0.38	0.08	0	0.26
	Technical College	0.07	0	0.26	0.03	0	0.16
	Vocationsl School	0.06	0	0.23	0.07	0	0.25
	Two-Year College,	0.14	0	0.35	0.13	0	0.33
	University (Four Year)	0.42	0	0.49	0.55	1	0.50
	Graduate School	0.12	0	0.33	0.15	0	0.36

Note: The sample size of the US sample is 404, while that sample size of Japan sample is 479.